To: Amber Hughes[ahughes@blm.gov]; Betenson, Matthew[mbetenso@blm.gov]
Cc: Blake Busse[blake.busse@empsi.com]
From: Kate Krebs
Sent: 2017-03-06T15:35:13-05:00
Importance: Normal
Subject: Revised MMP-A/EIS Based on WO Review
Received: 2017-03-06T15:35:52-05:00
GSENM_LivestockGrazingMMPA-EIS.zip
201701_GSENM_ADEIS_WO-Cmt_ALL_response.docx

Matt and Amber:

Attached is the edited version of the MMP-A/EIS based on Washington Office comments (including those that Cindy forwarded late last week). I have attached all of the files but edits have been made to the following chapters/appendices:

- Executive Summary
- Chapter 1
- Chapter 2
- Chapter 3
- Chapter 4
- Glossary
- Appendix D (Forage Model)

I have also attached the comment response table. We have responded to almost all of the comments; there are a couple of comments specifically flagged for the BLM that you will have to respond to. Look for the green highlighting. In some cases I have included some notes about the comment or response. Please go ahead and edit the files directly.

Please complete your review of the revisions and responses to comments by COB Wednesday and send the files back to me. You may edit all files directly. I have locked the files in track changes. After receiving the files back from you we will "format" the document so that it looks like all of the edits were from a single author. The files will be PDF'd to send back to Washington. We'll be ready to submit the files after the conversation with the SOLs on Friday. If there are changes to Alternative C, we will hold the files until we can discuss the course of action.

Please feel free to call Blake or me during your review if you have any questions. Also, please let us know on Friday the outcome of the SOL meeting.

Kate

Kate Krebs
EMPSi Environmental Management and Planning Solutions, Inc.
3775 Iris Avenue, Suite 1A
Boulder, CO 80301
tel: 303-447-7160 fax: 866-625-0707
www.EMPSi.com Twitter: EMPSInc Facebook: EMPSi

Bringing clarity to the complex ™

GSA Contract GS10F-0412S

Denver Portland Reno San Francisco Santa Fe Washington, DC

Appendix D

Forage Analysis Model

TABLE OF CONTENTS

Chapter Page

TABLES

Page

FIGURES

Page

This page intentionally left blank.

D. Forage Analysis Model

DO NOT DELETE THIS PAGE from the MS Word file, as this is what marks Heading 1 for the table of contents. (Do delete this page later from the Adobe Acrobat [pdf] file.)

THROW THIS PAGE AWAY & DELETE FROM PDF

APPENDIX D
FORAGE ANALYSIS MODEL

D.1 INTRODUCTION

This appendix contains information pertaining to the development of the Forage Analysis Model, the methodology underlying the model, and the model's results.

The Forage Analysis Model was developed to analyze the potential forage availability in the decision area under the various alternatives. Due to limitations with the model and the underlying data, it is only appropriate to use the model's results for comparative purposes. For example, while soil survey data is relatively good within the region, it is still absent for some locations and is at too coarse of a scale for a high degree of confidence in the model-derived AUM number for each alternative. Further, the results of the model have not been ground-truthed. In other words, the analytical value of the model lies not in the actual AUM numbers themselves, but in the comparative relationship of the action alternatives to the no action alternative, as expressed in percent change from the no action alternative.

The Forage Team is composed of rangeland experts associated with this planning effort's cooperating agencies. The team met throughout the planning process to develop a methodology, based on existing range science and the best available data, for determining the quantity of forage available for livestock grazing in the decision area. The result of their work is contained in the Forage Team Report. The report is a technical document that provides the general process, assumptions, and data to be used in the Forage Analysis Model. The complete Forage Team Report is available in **Section D.3**, Forage Team Report, of this appendix.

While the Forage Team Report provides the framework for conducting the forage analysis, it is not setup as a GIS model. In order to create a GIS-compatible model that could be run in the GIS software ArcMap, a GIS methodology was developed from the Forage Team Report. In other words, the GIS methodology takes the substance of the Forage Team's technical report and provides a step-by-step geospatial approach for converting the report into a model (i.e., the Forage Analysis Model). The complete GIS methodology, other supporting documents, and data layers are available for download on the project's ePlanning webpage.

Both the Forage Team Report and the GIS methodology are technical in nature and may not be readily understood by non-specialists in the rangeland management or GIS fields, respectively. As a result, **Section D.2**, Summary Explanation of Forage Analysis Model and Results, of this appendix seeks to convey the report, methodology, and results in a more readily understood format.

D.2 SUMMARY EXPLANATION OF FORAGE ANALYSIS MODEL AND RESULTS

Table D-1, Forage Analysis Model Summary Results, provides a summary of the results of the Forage Analysis Model by alternative. In addition to the total AUM number derived from the model, individual components of an alternatives' total are presented. Following the table is a row-by-row description of **Table D-1** with two supporting maps: **Figure D-1**, Slope, and **Figure D-2**, Vegetative Treatments.

Table D-1
Forage Analysis Model Summary Results

			Alternative A	Alternative C	Alternative D	Alternative E
1	**Areas used for determining forage availability**	*type*	available, unalloted, reserve common allotment	available	available	available, reserve common allotment
		total acres	2,089,000 acres	1,619,700 acres	2,135,200 acres	2,065,300 acres
		acres with slopes <60 degrees	1,772,700 acres	1,382,200 acres	1,807,700 acres	1,739,400 acres
2	**Alternative provides for restoration of seedings?**	*Yes/No*	Yes, current values used	No, current values used	Yes, full restoration value used	Yes, full restoration value used
		Lbs of forage	10,916,148 lbs	8,451,939 lbs	22,563,826 lbs	22,442,455 lbs
		Acres	98,200 acres	70,400 acres	98,200 acres	97,600 acres
3	**Alternative provides for treatment of late successional big sagebrush sites?**	*Yes/No*	Yes, post-treatment values	No, pre-treatment values	Yes, post-treatment values	Yes, post-treatment values
		Lbs of forage	1,831,351 lbs	389,453 lbs	1,833,176 lbs	1,821,656 lbs
		Acres	20,400 acres	18,100 acres	20,400 acres	20,300 acres
4	**Alternative considers treating pinyon-juniper encroached big sagebrush sites?**	*Yes/No*	Yes, post-treatment values	No, pre-treatment values	Yes, post-treatment values	Yes, post-treatment values
		Lbs of forage	434,646 lbs	94,573 lbs	441,080 lbs	434,541 lbs
		Acres	6,800 acres	5,700 acres	6,900 acres	6,800 acres

Table D-1
Forage Analysis Model Summary Results

			Alternative A	Alternative C	Alternative D	Alternative E
5	**Alternative considers treating pinyon-juniper infill sites?**	*Yes/No*	Yes, post-treatment values	No, pre-treatment values	Yes- post-treatment values	Yes- post-treatment values
		Lbs of forage	1,750,143 lbs	533,749 lbs	1,758,351 lbs	1,709,549 lbs
		Acres	75,700 acres	54,600 acres	76,000 acres	74,200 acres
6	**Areas of overlapping of pinyon-juniper infill and pinyon-juniper encroached big sagebrush**	*Yes/No*	Yes, post-treatment values	No, pre-treatment values	Yes, post-treatment values	Yes, post-treatment values
		Lbs of forage	4,980,457 lbs	644,240 lbs	5,004,527 lbs	4,980,292 lbs
		Acres	67,000 acres	56,600 acres	67,400 acres	67,000 acres
7	**Areas where no vegetative treatment would be applied**	*Lbs of forage*	31,544,936 lbs	24,408,388 lbs	32,347,457 lbs	30,982,074 lbs
		Acres	1,504,700 acres	1,177,000 acres	1,538,900 acres	1,488,600 acres
8	**Total lbs of forage available**		**51,457,685 lbs**	**34,522,345 lbs**	**63,948,422 lbs**	**62,370,570 lbs**
9	**Total AUMs**		**65,700 AUMs**	**44,100 AUMs**	**81,700 AUMs**	**79,700 AUMs**

Source: BLM GIS. 2014. Base GIS data on file with BLM's eGIS Server used to describe the GSENM decision area and planning boundary. BLM, Grand Staircase-Escalante National Monument, Utah. Updated through July 2014.

Note: The component pounds of forage numbers presented in the table include adjustments as directed by the model (e.g., slope and harvest efficiency). Acres are rounded to the nearest 100 and AUMs are rounded to the nearest 100. Acres and pounds of forage may not total due to rounding.

D.2.1 Explanation of Summary Table

Row 1 displays an important input criterion for the model: the number of acres where livestock grazing may occur by alternative. Under the alternatives, as described in **Chapter 2**, areas are classified for different types of management as they relate to livestock grazing. The "*type*" row depicts which of those management types were included in the determination of available forage. The "*total acres*" row displays the cumulative acreage of those areas listed in the "*type*" row.

Additionally, certain adjustments to forage availability are made based on the slope of an area. This was done to reflect the relative preference of cattle to flatter areas than to steeper hillsides. Four slope categories with corresponding forage adjustments are included in the Forage Team Report. The steeper the slope, the less forage is considered available. For areas with slopes greater than 60 degrees, these areas are considered inaccessible to cattle and forage produced in these areas is excluded from the model. The final sub-row under Row 1, "*acres with slopes <60 degrees*," displays the remaining forage producing areas after the steepest and inaccessible slope category is excluded. **Figure D-1**, Slope, displays the slope adjustments that were used by slope category. The model results for pounds of forage displayed in **Table D-1**, Forage Analysis Model Summary Results, reflect the corresponding slope adjustments for the remaining slope categories.

Figure D-1 Slope

1

Figure D-2 Vegetative Treatments

For example, under Alternative A, allotments that are available for livestock grazing, areas that are currently unalloted, and reserve common allotments were included in the calculation of available forage under this alternative. Cumulatively, these areas total 2,089,000 acres under Alternative A. After removing areas with slopes greater than 60 degrees, the potential forage-producing acres for livestock under Alternative A is reduced to 1,772,700 acres. These acres can be thought of as the “base producing acres” from which forage for livestock can be produced.

After determining the base producing acres, as summarized in Row 1, Rows 2 through 7 depict the forage production values that were assigned to the base producing acres, in accordance with the Forage Team Report. Rows 2 through 6 depict various potential vegetative treatments and their associated forage production, while Row 7 depicts areas that were not identified for a vegetative treatment and its associated forage production. See **Figure D-2**, Vegetative Treatments, for a visual depiction of these areas’ locations.

Row 2 pertains to seedings and the restoration of existing seedings. GSENM range staff identified existing range seedings through a GIS mapping exercise. Forage production of those seedings was estimated on a scale of low, medium, or high based on the seedings’ current ecological condition. These estimates are considered the “current” values of those seedings, as that term is used in Row 2. A seeding which has been fully restored is considered to have the equivalent forage production as the “high” producing condition. Alternatives D and E allow for the restoration of seedings; therefore, the full restoration value (or “high” value) was used to calculate their forage production. Alternative C does not allow for the restoration of seedings; therefore, the “current” values were used. While Alternative A allows for the restoration of seedings, the current values were used in order to better reflect the existing condition.

Rows 3 through 6 pertain to certain vegetative treatments for sagebrush or pinyon-juniper that would increase forage production in areas identified as potentially suitable for those treatments. GIS analysis was conducted to identify potentially suitable treatment locations. Areas were determined to be potentially suitable for treatment when its current vegetative condition differed from its historic vegetative condition as described in the Ecological Site Description (ESD). For specific analysis criteria, see “Adjustments to Total Available Forage Production” in the **Section 3**. Forage production values were assigned to treatment areas (i.e., “post-treatment values”) based on the area’s applicable ESD by the Forage Team. Alternatives A, D, and E allow for the implementation of vegetative treatments; therefore, post-treatment values were used in the model under these alternatives. Conversely, Alternative C does not allow for these vegetative treatments; therefore, pre-treatment values (i.e., those obtained from the ESD) were used in the model for Alternative C.

Row 7 depicts forage production in areas that do not contain an existing seeding and that were not identified as potentially suitable for the listed vegetation treatments. Forage production values for these areas were obtained primarily from applicable ESDs where available. Gaps in ESD data were filled using unpublished data from the NRCS and data from LANDFIRE, as needed. The “no vegetative treatment” areas constitute the majority of the acres within the decision area, as well as the majority of the forage production.

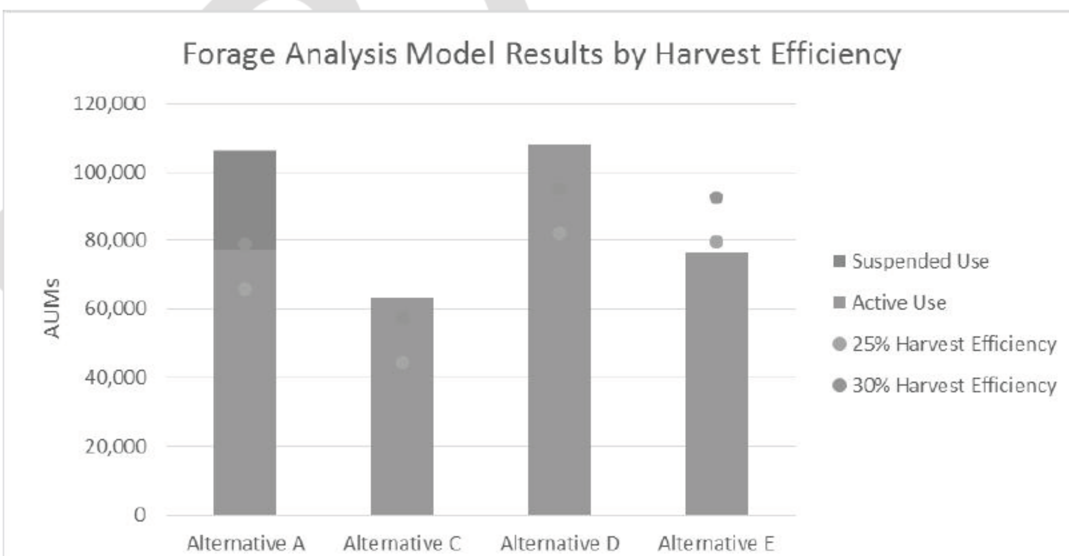
Row 8, "Total lbs of forage available," sums the component forage production identified in Rows 2 through 7.

Row 9 displays the final result of the Forage Analysis Model in terms of "Total AUMs." In other words, based on the methods outlined in the Forage Team Report and as applied via the GIS methodology, the model predicts that the decision area has sufficient forage available to support the respective number of AUMs for that alternative. As described in the Forage Team Report, the forage requirement for an AUM in the decision area is 783 pounds per AUM. Therefore, the AUM numbers in Row 9 were calculated by dividing the total pounds of forage available in Row 8 by 783.

D.2.2 Other Items to Note Regarding the Forage Team Report and Forage Analysis Model

Harvest Efficiency

The Forage Team determined that a 25 percent harvest efficiency should be included in the model. Harvest efficiency is the percentage of forage actually ingested by livestock from the total amount of forage produced. The 25 percent harvest efficiency has been applied to the model results presented in **Table D-1**, Forage Analysis Model Summary Results. The Forage Team recognizes the limitations of the existing research on harvest efficiency as that research relates to conditions in the decision area. For the GSENM region, a higher harvest efficiency may be more appropriate. For every 5 percentage point increase in harvest efficiency, AUMs will increase by approximately 13,100. Because this is a linear factor, equally applicable across alternatives, changing the harvest efficiency does not alter the percent change calculations used in **Chapter 4**.



New Seedings under Alternative D

Alternative D differs from the other alternatives in that it allows for the implementation of new seedings purposely to increase forage for livestock grazing within GSENM. Because the

determination of areas for new seedings is site specific, they were not identified for inclusion in this planning-level model. If Alternative D is selected and new seedings implemented, the pounds of available forage for livestock would increase above what is currently predicted by the model.

Existing Seedings

Not all seedings in GSENM are historical seedings developed for livestock forage. Some are restoration or rehabilitation treatments for fire or oil exploration sites. These types of treatments would have a lower forage production value than those seedings developed for livestock forage that could be retreated.

Distance to Water

The Forage Team considered distance to water as an additional limiting factor in the model. However, the final Forage Team Report does not include distance to water a limiting factor in the model for three primary reasons: (1) the ability to implement water developments is common to all alternatives that include livestock grazing, (2) there was no reliable way to map physical barriers to water, such as pasture fences or cliffs, and (3) snowmelt on winter pasturage and seasonal moisture also presented mapping challenges.

Treatment Areas in Glen Canyon

Figure D-2, Vegetative Treatments, depicts several small and scattered areas of pinyon-juniper infill sites as potentially suitable for treatment within the boundary of Glen Canyon. The National Park Service does not do vegetative treatments for the purpose of increasing forage for livestock. Vegetative treatments can occur on NPS-managed lands if an area is outside of its zone of natural variability. These pinyon-juniper infill sites in Glen Canyon were identified because the entire decision area was included in the analysis that identified potentially suitable areas for vegetative treatments. Thus, although these sites contribute a maximum of approximately 670 acres and 35 AUMs, due to their relatively small size, the inclusion of these areas in the model does not significantly impact the model's final results.

D.3 FORAGE TEAM REPORT

Forage Team Report

September 2016

GSENM Grazing Amendment EIS

BACKGROUND

GSENM is developing a land use plan amendment specific to livestock grazing. During alternative development discussions it was identified that a process to estimate available livestock forage be completed.

Garfield and Kane Counties (the Counties) specifically identified a desire for an alternative which emphasized active management of range resources through vegetative treatment and water development to meet rangeland health standards, improve resource conditions, and provide forage for livestock and wildlife. To do so the process would need to provide for estimates based on current conditions and the conditions resulting from the development of rangeland

improvements. It was agreed that a general (area wide) estimate of available AUMs could be made using GIS processes, forage production estimates in existing ESDs, adjustment factors for limitations to livestock use, and adjustments for the implementation of rangeland improvement practices. A team of experts, here after referred to as the Forage Team, was established through coordination with the Cooperators and met via conference call on multiple separate occasions to discuss proper procedures for such a process. The Forage Team relied in part on the processes as outlined in the NRCS's National Range and Pasture Handbook (NRPH)[1]. Many of the principles applied are described in detail in Chapters 5 "*Calculating stocking rates*" and Chapter 6 "*Maintaining a balance between livestock numbers and available forage*" of the NRPH.

BLM's past National Range Handbook (H-4410-1) adopted procedures from the NRPH and in section 602.1 (b) acknowledged that such models estimating "initial stocking rates" can be used as a basis for "describing different levels of stocking rates as alternatives in resource management plans and environmental impact statements". Another BLM Handbook for land use planning (H-1601-1) directs BLM to "for lands available for livestock grazing, identify on an area-wide basis both the amount of existing forage available for livestock (expressed in animal unit months) and the future anticipated amount of forage available for livestock with full implementation of the land use plan" (Appendix C, part B. Livestock Grazing). The model, as proposed by the Forage Team is compliant with this direction and is intended to make an estimate of livestock forage availability on an area wide basis using a general broad brush approach using ESD production estimates and making adjustments for such things as slope, distance to water, vegetative treatment/restoration projects and the ability for permitted cattle to harvest available forage. Distance to water is a limiting factor (reduces AUMs) which was eventually removed from the analysis for the reasons described below.

Forage Team members and their association to the Cooperator's and BLM Included:

Allan Bate, GSENM, Rangeland Management Specialist
Matt Betenson, GSENM, Associate Monument Manager
Jason Bybee, GSENM, Rangeland Management Specialist
Troy Forrest, State of Utah, Grazing Improvement Program
Shane Green, National Resource Conservation Service
Kevin Heaton, State of Utah
Bill Hopkin, State of Utah, Grazing Improvement Program
Larry Lichthardt, BLM Utah State Office, Lead Rangeland Management Specialist
Richard Madril, GSENM, Assistant Monument Manager for Resources
Kevin Miller, GSENM, Ecologist
Lamar Smith, Consultant Kane County
John Spence, National Park Service
Sean Stewart, GSENM, Lead Rangeland Management Specialist

MODEL AND ASSUMPTIONS

<u>Estimation of Total Livestock Forage Production</u>

[1]NRCS (United States Department of Agriculture, Natural Resources Conservation Service). 2003. National Range and Pasture Handbook. 190-VI-NRPH, rev. 1, December 2003.

A. Using GIS, obtain acres of each ESD on the Monument and multiply the number of acres by the forage production of the grasses and forbs as shown in the ESD. Use the "representative value" under the "Production by Plant Type". Include only those areas "available" for livestock grazing as provided for in the alternative under consideration.
   - This will provide an estimate of total potential forage production (grasses and forbs) for the Monument based on current ESDs excluding shrub and tree production
   - Authorized livestock use on the Monument is for cattle with a few horses. No sheep use is authorized so production estimates for grasses and forbs will be a better estimate of forage species preferred by cattle.
   - The model acknowledges that cattle will incorporate shrub species in their diet by reducing the required forage per AUM by 10 percent (See *Forage Requirement of an AUM on the Monument* below).

B. Multiply the estimated total forage available by 25 percent (Harvest Efficiency). This will represent the amount of total forage calculated in part A that will be used by livestock. This is what actually "gets into the belly of the cow".
   - The 25 percent harvest efficiency provides for 50 percent of the total production to remain on site to maintain rangeland health and to aid in meeting Utah's Rangeland Health Standards. It also provides 25 percent of the total forage production for wildlife use and factors in what is known to be a certain amount of "waste" due to trampling, weathering and other natural losses in total forage production.
   - This calculation will provide an estimate of the total pounds of forage available for consumption by authorized livestock. For example, if the calculated forage production from as ESD, as done in part A, produces 400 pounds of forage per acre 100 pounds per acre (25 percent) will be available for livestock use in the model.
   - The 25 percent harvest efficiency is not a utilization level for livestock.

<u>Adjustments to Total Available Livestock Forage Production</u>

a. Topography (slope) and distance to water are physical limitations to a cow's ability to consume the forage produced on a given area. For this reason, the following slope and water adjustments factors will be applied to the livestock forage production estimate.
   1. The Forage Team discussed and decided to use the slope adjustment factors given as an example in the NRPH. These adjustment factors are as follows:

Slope: 0 – 15 percent	Adjustment Factor: 0 percent (Forage 100 percent Available)
Slope: 16 – 30 percent	Adjustment Factor: 30 percent
Slope: 31 – 60 percent	Adjustment Factor: 60 percent
Slope: >60 percent	Adjustment Factor: 100 percent (No Forage Available)

   2. Distance to water is a limiting factor (reduces AUMs) which was eventually determined to be a common factor within all alternatives and as such removed from the analysis. Additionally, the distance water dataset was problematic due to mapping of physical barriers, such as pasture fences and cliffs, and snowmelt

on winter pasturage resulting in a lack of confidence in the results. Analysis point 2 was not included, and do not factor into final model AUM results.

b. Current vegetative conditions and planned management actions were also determined by the Forage Team to be significant adjustments that should be made to any forage allocation estimate. Four circumstances were identified that could be adjusted for without extensive costly and time consuming inventories and include:

1. Conditions of existing seeding's.
   - Seedings established on Monument lands in the 50's and 60's are in a variety of ecological conditions. GSENM range staff was asked to identify the seeding's in a GIS mapping exercise and estimate the condition of these seeding's based on livestock forage production. The resulting condition classes include Low (200 lbs/acre), Medium (600 lbs/acre) and High (1000 lbs/acre).
   - More recent pinyon-juniper hand thinning projects were also identified and estimated at 200 lbs/acre. of total forage production.
   - Acres and production were estimated as follows:

Category	Acres	Pounds/acre	Production
High	18,245.41	1,000	18,245,000
Mod	33,032.44	600	19,819,464
Low	41,215	200	8,243,000
*P/J hand thinned	5,451.12	200	545,120

   - Adjust livestock forage production estimates by reducing production levels in the moderate, low, and Pinyon-Juniper Hand Thinned areas to 600, 200, and 200 lbs/acre respectively.
   - For any alternatives providing for the restoration of these seeding's adjust the low, moderate, and Pinyon-Juniper Hand Thinned acres to a future forage production level of 1000 lbs/acre.
   - The harvest efficiency of 25 percent would be applied to all forage production estimates so the restored seeding producing 1000 lbs/acre would provide 250 lbs/acre of livestock forage.
2. Late Successional Big Sagebrush Site
   - Using LANDFIRE, late successional big sagebrush sites where identified where sagebrush treatment would provide a healthier plant community and better forage production. Total acres of late successional big sagebrush sites came to 26,463 acres.
   - Under current conditions, limit total production levels to 55 or 105 lbs/acre depending on the ESD as shown in attachment II (pre-treatment column).
     - These production levels better estimate the current reduced levels of production on these late successional sagebrush sites.
   - For any action alternative proposing to treat these sites increase total forage production levels to 335 to 975 lbs/acre depending on the applicable ESD as shown in attachment I (post treatment column).

        - These production levels reflect the total (grasses, forb, shrub and tree) potential production of these sites when treated to increase forage production.

3. Pinyon-Juniper Encroached Big Sagebrush Sites.
    - Using LANDFIRE, pinyon-juniper encroachment areas onto big sagebrush sites were identified. Total acres of pinyon-juniper encroachment onto big sagebrush sites came to 42,101.
    - Decreases forage production estimates on these big sagebrush sites to 55 lbs/acre as shown in attachment I (pre-treatment column). State and transition models (see attachment II) indicate that this level of production better reflects current conditions.
    - For any alternative considering treating these sites increase total forage production levels to 335 to 975 lbs/acre depending on the ESD as shown in attachment I (post treatment column).
        - These production levels reflect the total (grass, forb, shrub and tree) potential production based on state and transition models (see attachment II) and better reflect the anticipated increases in forage production with treatment of these sites to forage producing species (grasses and forbs).
4. Pinyon-Juniper "Infill" areas of Pinyon-Juniper Sites.
    - Using LandFire, pinyon-juniper "infill" areas were identified with a total of 83,831 acres.
    - Decrease forage production estimates on these "infill" sites to the identified lbs/acre (pre-treatment column) as shown in attachment I. State and transition models (see attachment II) when available where consulted as with other exercises for this model, however, these state and transition models are not as complete as the big sagebrush ESDs. Many of these ESDs, typically the upland ESDs, had no state and transition models from which to base pre or post treatment value, therefore, Professional judgment by the NRCS supported by some production data historically and recently collected were used to develop the 10 and 30 lbs. Pre-treatment values and the post treatment values are the sum of the grass and forb for the reference state or current potential for each ESD (see attachment I).
    - For any alternative considering treating these sites increase total forage production lbs/acre depending on the ESD as shown in attachment I.

c. For alternatives providing for water development remove the 50 percent adjustment factor applied to areas with limited water.
    1. Development of water in areas where livestock use is limited by water availability will provide for the full harvest efficiency of 50 percent. For this reason, forage production levels in these areas need not be limited.

Animal Unit Forage Requirement

- To calculate the number of Animal Unit Months (AUMs) a level of production can sustain the amount required for an animal unit must first be determined.

- For the definition of an "animal unit" the Forage Team relied on the Society of Rangeland Management definition as follows:

    > An animal unit is "considered to be one mature cow of about 1,000 pounds (450 kilograms), either dry or with calf up to 6 months of age, or their equivalent, consuming about 26 pounds (12 kilograms) of forage/day on an oven-dry basis".

    - The NRPH also identifies 26 pounds of forage per day, oven dry weight, as an appropriate amount of forage for an animal unit or 30 pounds of air dry forage which is 2.6 percent and 3.0 percent of body weight respectively.
    - The NRPH also acknowledges that research indicates that forage intake can range from a low of 1.5 percent to 3.5 percent of body weight as is affected by such things as forage quality, standing crop, topography, and watering facilities.
    - On BLM lands within the Monument all four of these criteria would limit livestock forage consumption.
    - Taking into consideration that livestock use of the GSENM has authorized livestock use at all times of the year and that the four criteria above all apply to the GSENM the Forage Team determined that a 2.6 percent intake by body weight would be appropriate or 26 pounds of air dry weight per animal unit.

Animal Size Specific to Monument Allotments

- The Forage Team also considered the weight of an average cow on the GSENM and based on the survey discussed below determined that the weight of a cow authorized to use BLM lands on the Monument to be 1,100 pounds.
- This results in each animal requiring 1.1 animal unit of forage or 28.6 lbs/cow per day.
    - An economic and cultural survey completed by Utah State University Extension and Economic Associates of Utah, Inc. for Kane County specific to permittees of the Monument found that average cull cow weights to be 1,115 and the weighted average to be 1,092 pounds.
    - The Forage Team determined that these cull cow weights were likely a good estimate of the cow weights authorized on BLM lands on the Monument.

Forage Requirement of an AUM on the Monument

- The need for 28.6 lbs forage per day per cow on the Monument results in a forage requirement of 870 lbs/AUM (28.6 x 365 days/12 months).
- As mentioned earlier the required 870 pounds of forage per AUM should be adjusted as cattle will use a limited amount of shrubs in their diet. The Forage Team determined that 10 percent of the diet of livestock on the allotment could likely come from use of shrubs. This results in an adjustment of the require forage (grasses and forbs) for an AUM to 783 pounds per AUM.

FINAL AUM CALCULATION

After determining the total livestock forage production as described above and having already adjusted for harvest efficiency, slope, water availability, seeding condition class, late successional big sagebrush, pinyon-juniper encroachment, and pinyon-juniper infill the number of AUMs potentially available on the Monument is calculated by dividing the livestock forage production by 783.

NOTE: It is encouraged to work closely with Shane Green, NRCS, the state and county contacts who proposed this effort and any necessary BLM staff when the contractors are working through the calculations to ensure clarity and intent is understood behind the process and numbers used.

The Forage Team has requested an opportunity to review the final calculations.*

[Note: The Forage Team's initial review of the model results was held via teleconference on June 24, 2016. During the call, Forage Team member's requested additional information regarding the development and outcomes of the Forage Analysis Model. This information was subsequently provided to the Forage Team. On September 13, 2016, GSENM staff, in conjunction with members of the Forage Team, presented the results of the Forage Analysis Model to the cooperating agencies.]

*A caution with the review is to not review the model to acquire a desired outcome. The criteria and numbers used in the model were fleshed out and agreed upon by the Forage Team and therefore should not be adjusted without good reason.

Appendix A

Current Management: Grand Staircase-Escalante National Monument

Appendix A
Current Management: Grand Staircase-Escalante National Monument

The existing MMP including its *Overall Vision for the Monument* contains information relevant to livestock grazing that would not be modified or changed by any alternative. Management direction related to livestock grazing from the MMP is included in this appendix.

Management Direction from the MMP

Science

The geology, soils, and erosional characteristics in the Monument and the resulting plant communities provide opportunities to test, validate, and develop management methods, criteria, or techniques which will lead to improved grazing practices. Similarly, the Monument may present opportunities for testing new partnership arrangements with grazing permittees and interested publics that will lead to improved grazing practices. It will be the policy of the Monument to encourage the use of the special characteristics of the Monument to facilitate such testing or research using scientific methods where appropriate (MMP, pp. 42-43).

Researchers will have to comply with the decisions in this Plan [the MMP]. However, some science and research activities may require the use of equipment, surface disturbance, and/or personnel which could exceed the management prescriptions outlined for visitors and other users. Except where specifically prohibited (e.g., in relict plant areas, wildlife protected activity centers), the BLM will consider exceptions to the Plan prescriptions during the special-use permitting process for extremely high-value research opportunities, especially for those opportunities that may not be available elsewhere. Research projects focused on protecting resources at risk will also be considered for exceptions to zone prescriptions. The GSENM Advisory Committee will be consulted on whether research proposals which require restricted activities warrant the requested exceptions. Evaluation will consider whether the proposed research can be permitted in a manner consistent with the protection of Monument resources, and whether the methods proposed are the minimum necessary to achieve the desired research objective (SCI-7, pp. 45).

NPS and BLM will cooperatively develop a natural and cultural resources monitoring plan that will address levels of effort necessary to meet NPS resource goals and objectives to protect recreation area values and purposes and effectively meet BLM grazing policy, standards, and guidelines. This monitoring plan will identify inventory and monitoring needs for proposed actions as well as long term needs (GzMP, pp. 9-10).

Livestock Grazing

Livestock grazing allotments will be evaluated, and grazing as it relates to all endangered species will be addressed during this process. Evaluations will incorporate the latest research and information in the protection of species. Section 7 consultation will be conducted for all allotments that may affect listed species during the individual allotments evaluations. This process will provide protection for listed and sensitive species as the evaluation will be site specific for each of the allotments (MMP SSA-8, p. 14).

Actions will be taken to improve identified habitat for Kanab ambersnail (*Oxyloma hadeni kanabensis*) as consistent with the recovery plan objectives. Actions may include assuring flows in appropriate streams and seeps by removing non-native plants affecting the water table and reducing impacts from visitors and/or livestock. Surveys will also identify current habitat and habitat that is potential if modifications are made (MMP SSA-24, p. 17).

Fences may be used in certain circumstances to protect Monument resources, to manage visitor use, and to manage livestock, consistent with the Proclamation. They will be designed and constructed in accordance with visual resource management objectives and the Monument Facilities Master Plan (see the Visual Resource Management section for related decisions) (MMP FENCE-1, p. 39).

The BLM will be responsible for administrative routes which will be limited to authorized users. These are existing routes that lead to developments which have an administrative purpose, where the BLM or some permitted user must have access for regular maintenance or operation. These authorized developments include such things as power lines, cabins, weather stations, communication sites, spring developments, corrals, and water troughs. Routes designated open for certain administrative purposes (approximately 182 miles) are shown on Map 2 [of the MMP]. Access will be strictly limited and will only be granted for legitimate and specific purposes. Maintenance will be the minimum required to keep the routes open for limited use by high clearance vehicles. If the administrative purpose of the route ceases, the route will be evaluated for closure following public notification and opportunity to comment. Authorized users could include grazing permittees, researchers, State or Federal Agencies, Native American Indians accessing recognized traditional cultural properties, and others carrying out authorized activities under a permit or other authorization (MMP TRAN-15, pp. 47-48).

Beyond the routes shown on Map 2 [of the MMP], the BLM will work with any individual operating within the Monument under existing permits or authorizations to document where access must continue in order to allow operation of a current permit or authorization. Routes that go only to BLM range monitoring and study areas will not be maintained, but periodic vehicular access to these sites will be granted for required range monitoring uses (MMP TRAN-16, p. 48).

Grazing permits are also in this category [Valid Existing Rights and Other Land Use Authorizations]. Grazing permits or leases convey no right, title, or interest in the land or resources used. Although the Proclamation specifically mentions livestock grazing, it does not establish it as a "right" or convey it any new status. The Proclamation states "grazing shall continue to be governed by applicable laws and regulations other than this proclamation," and says that the Proclamation is not to affect existing permits for, or levels of, livestock grazing within the Monument, just as in other BLM livestock grazing administration programs (MMP VER-8, p. 54).

Wildlife Services (formerly Animal Damage Control) activities within the Monument will be limited to the taking of individual coyotes within the immediate vicinity after verified livestock kills, where reasonable livestock management measures to prevent predation had been taken and had failed. Reasonable livestock management measures could include preventative measures to control predation, such as managing where calving occurs, in order to develop improved land management practices (MMP WS-1, p. 56).

As the focal point for visitation, visitor day-use facilities and signs will be added as necessary for visitor use, safety, and the protection of sensitive resources, in addition to existing facilities (MMP FAC-8, p. 37).

The condition of routes and distance from communities in the Passage Zone makes it a secondary zone for visitation. Similar facilities as allowed in the Front Country Zone could be provided for resource protection, visitor safety, or for the interpretation of Monument resources. Information kiosks approximately the size of two 3 foot by 5 foot panels will be located at major trailheads (e.g., The Gulch, Deer Creek, and Dry Fork), and smaller kiosks or signs will be located at less used trailheads. Rarely used trailheads will be identified with a small sign (MMP FAC-11, p. 38).

Small signs to educate the public about a particular resource or safety hazard may be installed at limited sites [in the Outback Zone], but these sites will not be promoted in literature (MMP FAC-16, p. 39).

Limited signs could be allowed for resource protection or public safety [in the Primitive Zone]. Small directional signs may be needed, but these will be kept to an absolute minimum and will be rare (MMP FAC-19, p. 39).

In accordance with BLM Manual 6330, new livestock management developments within BLM wilderness study areas may only be approved if they meet the non-impairment standard or one of the exceptions, such as protecting or enhancing wilderness characteristics. In determining whether a development meets the protecting or enhancing wilderness characteristics exception, the BLM will determine if the structure's benefits to the natural functioning of the ecosystem outweigh the increased presence of human developments and any loss of naturalness or outstanding recreational opportunities caused by the new development.

New range developments in wilderness study areas may not be approved for the purposes of increasing AUMs nor would a facility or use be approved if new motorized access is required (BLM Manual 6330).

Vegetation

Goal

The Monument will be managed to achieve a natural range of native plant associations. Management activities will not be allowed to significantly shift the makeup of those associations, disrupt their normal population dynamics, or disrupt the normal progression of those associations (MMP, p. 22).

Objective

The overall objective with respect to riparian resources within the Monument is to manage riparian areas so as to maintain or restore them to properly functioning conditions and to ensure that stream channel morphology and functions are appropriate to the local soil type, climate, and landform (MMP, p. 20).

Action

All segments of riparian habitat previously inventoried will be reassessed as part of the grazing allotment assessments. Furthermore, riparian areas that have not been previously evaluated will be scheduled for assessment within three years commencing on the first July 1 following approval of the Plan, as part of the grazing evaluation schedule (MMP RIPA-2, p. 20).

Action

Monitoring of riparian resource conditions will be established to determine when actions should be taken to ensure movement towards proper functioning condition on all riparian stream segments in the Monument (MMP RIPA-3, p. 20).

Objective

A variety of vegetation restoration methods may be used to restore and promote a natural range of native plant associations in the Monument. Methods and projects which do not achieve this objective or which irreversibly impact Monument resources will not be permitted. Vegetation restoration methods fall into four broad categories: mechanical, chemical, biological, and management ignited fires (MMP, p. 22-27). Each of these methods will be used in accordance with the overall vegetation objectives discussed above, and progress towards these objectives will monitored as part of the adaptive management framework described in Chapter 3.

Action

With all of the methods described above [RM-1 through RM-6 of the MMP], vegetation monitoring plots will be established to determine the effectiveness of the treatments in achieving management objectives and to provide baseline data of overall change. This monitoring will include species frequency, density, and distribution data, and will be part of the overall adaptive management framework described in Chapter 3 (MMP RM-7, p. 27).

Action

In keeping with the overall vegetation objectives and Presidential Executive Order 11312, native plants will be used as a priority for all projects in the Monument (MMP NAT-1, p. 28).

Action

Non-native plants may be used in limited, emergency situations where they may be necessary in order to protect Monument resources by stabilizing soils and displacing noxious weeds. This use will be allowed to the extent that it complies with the vegetation objectives, Presidential E[xecutive] O[rder] 11312, and the Standards for Rangeland Health and Guidelines for Grazing Management for BLM Lands in Utah (1997). In these situations, short-lived species (i.e., nurse crop species) will be used and will be combined with native species to facilitate the ultimate establishment of native species (MMP NAT-2, p. 28).

Action

Many factors will be considered when deciding to implement a revegetation or restoration strategy. Each project and area to be treated will be evaluated to determine the appropriate strategy. The following general guidelines can be applied to determine which strategy is the most appropriate and how it will be implemented in order to be consistent with the overall vegetation management objectives.

- Restoration will be the goal whenever possible (i.e., an attempt will be made to return disturbed areas to conditions which promote a natural array of native plant and animal associations).
- Species used in both restoration and revegetation projects will comply with the non-native plant policy described above (i.e., native plants will be used as a priority).
- Revegetation strategies will be used in areas of heavy visitation, where site stabilization is desired.
- Restoration provisions will be included in all surface disturbing projects including provisions for post restoration monitoring of the area. Costs for these activities will be included in the overall cost of the project and will come out of the entire project budget.
- Priority for restoration or revegetation will be given to projects where Monument resources are being damaged. These sites will likely be in areas near development and/or heavy visitor use. Although these areas are more likely to be candidates for revegetation projects, careful evaluation of disturbed sites needs to be conducted to include desired future condition of an area. Restoration or revegetation of areas receiving heavy use may include limits on visitor use in order to promote recovery (MMP REV-1, p. 31).

Soils and Biological Soil Crusts

Objective

The overall objective with respect to soil resources within the Monument is to:

- manage uses to prevent damage to soil resources and to ensure that the health and distribution of fragile biological soil crusts is maintained or improved,
- increase public education and appreciation of soils and biological soil crusts through interpretation, and

- facilitate appropriate research to improve understanding and management of soil resources and biological soil crusts (MMP, p. 21).

Action
The BLM will apply procedures to protect soils from accelerated or unnatural erosion in any ground disturbing activity, including route maintenance and restoration. The effects of activities such as grazing developments, mineral exploration or development, or water developments will be analyzed through the preparation of project specific NEPA documents. This process will include inventories for affected resources and the identification of mitigation measures (MMP SOIL-1, p. 21).

Action
Prior to any ground disturbing activity, the potential effects on biological soil crusts will be considered and steps will be taken to avoid impacts on their function, health, and distribution. Long-term research toward preservation and restoration of soils will be part of the adaptive management framework described in Chapter 3. Further research will be conducted on these crusts, and the results interpreted for management and education purposes (MMP SOIL-2, pp. 21-22).

Management Direction from the Utah Greater Sage-Grouse Approved Resource Management Plan Amendment

In September 2015, the BLM Utah signed a plan to manage greater sage-grouse habitat on BLM-administered lands in Utah, which amended the MMP. There are 10,200 acres of greater-sage grouse priority habitat management areas (PHMA) in the northwestern portion of GSENM affected by the decision. The following actions from that plan pertain to livestock grazing where it overlaps with PHMA.

MA-LG-1: PHMA and GHMA will be available for livestock grazing (Figure 2-3, Livestock Grazing [Appendix A] [of the Utah Greater Sage-Grouse Approved Resource Management Plan Amendment; BLM 2015]). Active animal unit months (AUMs) for livestock grazing will be 329,521[1] on BLM lands. Make adjustments to permitted AUMs consistent with regulation and the remaining grazing direction. In addition, on an annual basis livestock numbers and the season of use can be adjusted within the terms and conditions of the permit.

Make adjustments to permitted use and annual adjustments to levels of livestock use consistent with regulation and the direction identified below where livestock grazing is identified as a causal factor for not meeting standards or habitat objectives.

MA-LG-2: The BLM will prioritize (1) the review of grazing permits/leases, in particular to determine if modification is necessary prior to renewal, and (2) the processing of grazing permits/leases in SFA first followed by PHMA outside SFA. In setting workload priorities, precedence will be given to existing permits/leases in these areas not meeting Land Health Standards, with focus on those containing riparian areas, including wet meadows. The BLM may

[1] This is total AUMs in the Utah subregion. Only a portion of this is within GSENM.

use other criteria for prioritization to respond to urgent natural resource concerns (ex., fire) and legal obligations.

MA-LG-3: In PHMA, consult, cooperate, and collaborate with other land owners and management agencies (e.g., private and SITLA) to develop plans which provide for landscape level approaches to habitat improvement. Manage unfenced private and SITLA lands within a grazing allotment that are under exchange of use agreements or percent public land use as a single unit that will have the same management as the public lands.

MA-LG-4: Evaluate Utah's Rangeland Health Standards and process grazing permits. Focus monitoring and management activities on allotments found not to be achieving Utah's Rangeland Health Standards where livestock grazing is identified as a causal factor and that have the best opportunities for conserving, enhancing or restoring habitat for GRSG.

Use ecological site descriptions and/or other appropriate information to determine the desired plant community within proper functioning ecological processes for conducting land health assessments to evaluate the achievement or non-achievement of rangeland health standards.

MA-LG-5: In PHMA and GHMA, conduct land health assessments that include indicators and measurements of structure, condition, composition, etc., of vegetation specific to achieving GRSG habitat objectives (Objective SSS-3 [of the Utah Greater Sage-Grouse Approved Resource Management Plan Amendment; BLM 2015]), including within wetlands and riparian areas. Prioritize land health assessments in SFA, followed by PHMA outside of the SFA. Conduct land health assessments at the watershed scale and use the GRSG habitat objectives when assessing the applicable standard in GRSG habitats.

MA-LG-6: In PHMA, when livestock management practices are determined to not be compatible with meeting or making progress towards achievable habitat objectives following appropriate consultation, cooperating and coordination, implement changes in grazing management through grazing authorization modifications, or allotment management plan implementation. Potential modifications include, but are not limited to, changes in:

- Season or timing of use;
- Numbers of livestock;
- Distribution of livestock use;
- Duration and/or level of use;
- Kind of livestock (e.g., cattle, sheep, horses, or goats); and
- Grazing schedules (including rest or deferment).

**Not in priority order*

The NEPA analysis for renewals and modifications of livestock grazing permits/leases that include lands within SFA and PHMA will include specific management thresholds based on **Table 2-2**, Land Health Standards [of the Utah Greater Sage-Grouse Approved Resource Management Plan Amendment; BLM 2015] (43 CFR 4180.2), and ecological site potential, and

one or more defined responses that will allow the authorizing officer to make adjustments to livestock grazing that have already been subjected to NEPA analysis. Adjustments to meet seasonal GRSG habitat requirements could include those items identified in the list above.

MA-LG-7: In PHMA, during drought periods, prioritize evaluating effects of the drought relative to GRSG needs for food and cover.

Initiate emergency management measures (e.g. delaying turnout, adjusting the amount and/or duration of livestock grazing, implement other terms of the permit) during times of drought to protect GRSG habitat, in accordance with Instruction Memorandum 2013-094 (Resource Management During Drought), or other agency policies.

Implement post-drought management to allow for vegetation recovery that meets GRSG needs.

MA-LG-8: In PHMA, manage riparian areas and wet meadows for proper functioning condition.

MA-LG-9: In PHMA, assess livestock grazing in riparian and meadow complexes and ensure recovery or maintenance of appropriate vegetation and water quality. Where recovery or maintenance is not occurring and the causal factor is livestock grazing, reduce pressure on riparian or wet meadow vegetation used by GRSG in the summer by adjusting grazing management practices (e.g., use fencing/herding techniques, or changes in seasonal use or livestock distribution).

Allotments within SFA, followed by those within PHMA, and focusing on those containing riparian areas, including wet meadows, will be prioritized for field checks to help ensure compliance with the terms and conditions of the grazing permits. Field checks could include monitoring for actual use, utilization, and use supervision.

MA-LG-10: In PHMA, limit authorization of new water developments to projects that have a neutral effect or are beneficial to GRSG habitat (such as by shifting livestock use away from critical areas). New developments that divert surface water must be designed to maintain riparian or wet meadow vegetation and hydrology to meet GRSG needs.

MA-LG-11: In PHMA, evaluate existing water developments (springs, seeps, etc., and their associated pipelines) to determine if modifications are necessary to maintain or improve riparian areas and GRSG habitat. Make modifications where necessary, considering impacts on other water uses when such considerations are neutral or beneficial to GRSG.

MA-LG-12: In PHMA, ensure that vegetation treatments conserve, enhance or restore GRSG habitat (this includes treatments that benefit livestock).

MA-LG-13: In PHMA, evaluate the role of existing seedings that are currently composed of primarily introduced perennial grasses to determine if they should be restored to sagebrush or habitat of higher quality for GRSG. If existing seedings provide value in conserving or enhancing GRSG habitats, then no restoration will be necessary. Assess the compatibility of these seedings for GRSG habitat during the land health assessments.

MA-LG-14: In PHMA, design new structural range improvements to have a neutral effect or conserve, enhance, or restore GRSG habitat through an improved grazing management system relative to GRSG objectives. Structural range improvements, in this context, include but are not limited to: cattle guards, fences, exclosures, corrals or other livestock handling structures; pipelines, troughs, storage tanks (including moveable tanks used in livestock water hauling), windmills, ponds/reservoirs, solar panels and spring developments. Potential for invasive species establishment or increase following construction must be considered in the project planning process and monitored and treated post-construction.

MA-LG-15: In PHMA, evaluate existing structural range improvements to make sure they have a neutral effect or conserve, enhance or restore GRSG habitat.

MA-LG-16: To reduce outright GRSG strikes and mortality, remove, modify or mark fences in high risk areas (Stevens et al. 2012) based on proximity to lek (e.g., within 1.2 miles of a lek), lek size, and topography, or as latest science indicates. Prioritize actions in SFA first, then PHMA.

Employ NRCS fence collision risk tool (NRCS/CEAP Conservation Insight Publication “Applying the Sage Grouse Fence Collision Risk Tool to Reduce Bird Strikes”).

MA-LG-17: In PHMA, monitor for and treat noxious weeds and treat invasive species where needed, associated with existing range improvements.

MA-LG-18: At the time a permittee or lessee voluntarily relinquishes a permit or lease, the BLM will consider whether the public lands where that permitted use was authorized should remain available for livestock grazing or be used for other resource management objectives, such as reserve common allotments or fire breaks. This does not apply to or impact grazing preference transfers, which are addressed in 43 CFR 4110.2-3.

Southwestern Willow Flycatcher Management

The USFWS has developed a recovery plan for the southwestern willow flycatcher, a federally endangered species. The recovery plan establishes recovery goals and objectives and describes site-specific management actions recommended to achieve those goals. It is not self-implementing, but presents a set of recommendations for managers and the general public, which are endorsed by the approving official at the USFWS. The current recovery plan, signed in 2002, describes management for livestock grazing in southwestern willow flycatcher habitat (USFWS 2002). The BLM will continue to manage livestock grazing to meet the guidelines in the recovery plan, including future revisions to the plan.

Public Participation in Livestock Grazing Management per the BLM Grazing Regulations (43 CFR Part 4100)

Becoming an “Interested Public”

Individuals who would like to be involved in livestock grazing management of GSENM should first become an “interested public.” Comments on livestock grazing are accepted by GSENM at any time.

There are two ways to become an "interested public":

1. Submit a written request to the Monument Manager requesting to be involved in the decision making process and identify the allotment(s) that you request to be involved with.

2. Submit written comments to a specific management action on a specific allotment. In April 2015, BLM Utah began transitioning to the ePlanning system for all new NEPA projects. The ePlanning system can be accessed at: https://eplanning.blm.gov/epl-front-office/eplanning/lup/lup_register.do.

Interested public(s) will be informed of and can participate in the following types of projects and/or actions:

- Allotment designations, adjustments and boundary determinations
- Adjustments in permitted use
- Allotment Management and resource activity plans
- Range Improvements
- Term or Non-renewable Grazing Permits or leases

Excerpts from the BLM Grazing Regulations (43 CFR Part 4100)

Sec. 4100.0-5 Definitions.
"Interested public" means an individual, group or organization that has submitted a written request to the authorized officer to be provided an opportunity to be involved in the decision making process for the management of livestock grazing on specific grazing allotments or has submitted written comments to the authorized officer regarding the management of livestock grazing on a specific allotment.

Sec. 4110.2-4 Allotments.
After consultation, cooperation and coordination with the affected grazing permittees or lessees, the State having lands or responsible for managing resources within the area, and the interested public, the authorized officer may designate and adjust grazing allotment boundaries. The authorized officer may combine or divide allotments, through an agreement or by decision, when necessary for the proper and efficient management of public rangelands.

Sec. 4110.3-1 Increasing permitted use.
Additional forage may be apportioned to qualified applicants for livestock grazing use consistent with multiple-use management objectives.

(c) After consultation, cooperation, and coordination, with the affected permittees or lessees, the State having lands or managing resources within the area, and the interested public, additional forage on a sustained yield basis available for livestock grazing use in an allotment may be apportioned to permittees or lessees or other applicants, provided the permittee, lessee, or other applicant is found to be qualified under subpart 4110 of this Part.

Sec. 4110.3-3 Implementing reductions in permitted use.

(a) After consultation, cooperation, and coordination with the affected permittee or lessee, the State having lands or managing resources within the area, and the interested public, reductions of permitted use shall be implemented through a documented agreement or by decision of the authorized officer. Decisions implementing § 4110.3-2 shall be issued as proposed decisions pursuant to 4160.1 of this part, except as provided in paragraph (b) of this section.

Sec. 4120.2 Allotment management plans and resource activity plans.

(a) An allotment management plan or other activity plans intended to serve as the functional equivalent of allotment management plans shall be prepared in careful and considered consultation, cooperation, and coordination with affected permittee(s) or lessee(s), landowners involved, the resource advisory council, any State having lands or responsible for managing resources within the area to be covered by such a plan, and the interested public. The plan shall become effective upon approval by the authorized officer.

(c) The authorized officer shall provide opportunity for public participation in the planning and environmental analysis of proposed plans affecting the administration of grazing and shall give public notice concerning the availability of environmental documents prepared as a part of the development of such plans, prior to implementing the plans. The decision document following the environmental analysis shall be considered the proposed decision for the purposes of subpart 4160 of this part.

(e) Allotment management plans or other applicable activity plans intended to serve as the functional equivalent of allotment management plans may be revised or terminated by the authorized officer after consultation, cooperation, and coordination with the affected permittees or lessees, landowners involved, the resource advisory council, any State having lands or responsible for managing resources within the area to be covered by the plan, and the interested public.

Sec. 4120.3-1 Conditions for range improvements.

(f) Proposed range improvement projects shall be reviewed in accordance with the requirements of the National Environmental Policy Act of 1969 (42 U.S.C. 4371 et seq.). The decision document following the environmental analysis shall be considered the proposed decision under subpart 4160 of this part.

Sec. 4130.2 Grazing permits or leases

(b) The authorized officer shall consult, cooperate and coordinate with affected permittees or lessees, the State having lands or responsible for managing resources within the area, and the interested public prior to the issuance or renewal of grazing permits and leases.

Sec. 4130.3-3 Modification of permits or leases.

Following consultation, cooperation and coordination with the affected lessees or permittees, the State having lands or responsible for managing resources within the area, and the interested public, the authorized officer may modify terms and conditions of the permit or lease when the active grazing use or related management practices are not meeting the land use plan, allotment management plan or other activity plan, or management objectives, or is not in conformance with the provisions of subpart 4180 of this part.

Sec. 4130.6-2 Nonrenewable grazing permits and leases.

Nonrenewable grazing permits or leases may be issued on an annual basis to qualified applicants when forage is temporarily available, provided this use is consistent with multiple-use objectives and does not interfere with existing livestock operations on the public lands. The authorized officer shall consult, cooperate and coordinate with affected permittees or lessees, the State having lands or responsible for managing resources within the area, and the interested public prior to the issuance of nonrenewable grazing permits and leases.

Sec. 4160.1 Proposed decisions

(a) Proposed decisions shall be served on any affected applicant, permittee or lessee, and any agent and lien holder of record, who is affected by the proposed actions, terms or conditions, or modifications relating to applications, permits and agreements (including range improvement permits) or leases, by certified mail or personal delivery. Copies of proposed decisions shall also be sent to the interested public.

Sec. 4160.2 Protests.

Any applicant, permittee, lessee or other interested public may protest the proposed decision under Sec. 4160.1 of this title in person or in writing to the authorized officer within 15 days after receipt of such decision.

Appendix B

Current Management: Glen Canyon National Recreation Area

APPENDIX B
CURRENT MANAGEMENT: GLEN CANYON NATIONAL RECREATION AREA

INTRODUCTION

Livestock grazing management in Glen Canyon is guided by the Glen Canyon GzMP (NPS 1999) and is also constrained by decisions in the Glen Canyon GMP and NPS Management Policies. Decisions in the GzMP and GMP would generally be the same across all alternatives. The alternatives may note specific decisions for clarification or modification. If no change or modification is noted, the current management would apply. Pertinent decisions from the GzMP are included below.

The goals and objectives in the GzMP will be used to make values and purposes determinations regarding proposed actions that are ground disturbing, such as range improvements. Actions and monitoring requirements found in Appendix D of the GzMP will be applied where applicable.

The BLM, in coordination with and approval from the NPS, will use resource goals and objectives in determining annual use levels to adjust the season of use or the number of animals as applicable.

The NPS will provide information regarding resource goals and objectives to the BLM to be incorporated into BLM planning documents such as allotment management plans and annual authorizations.

GzMP Implementation Guidance

"Under ordinary circumstances, when a permit transfer is proposed, the Glen Canyon Superintendent will respond with a Values and Purposes determination within 45 days. The NPS will evaluate all transfers. When a permit is transferred, the Superintendent may request that the BLM take action to incorporate changes necessary to meet resource goals and objectives into the permit. Such requests will be forwarded to the BLM as part of the Values and Purposes determination and identified as required mitigation for NPS approval of the proposed action or permit transfer" (GzMP, p. 10).

> "Unless there is unacceptable resource damage or no allotment management plan exists, transfers of allotment permits in the Maintenance Category should not require extensive administrative changes.
>
> Transfer of a permit for allotments in the Improvement Category will be approved only after the NPS has exercised the opportunity to amend the "terms" of the permit. The amendments will reflect the potential changes to management of a given allotment based upon monitoring data, standards and guidelines (BLM), goals and objectives (NPS), or an allotment evaluation. The purpose of the amendments will be to move the allotment from an improvement to maintenance category.
>
> Transfers of permits for allotments in the Custodial Category will be addressed on a case-by-case basis" (GzMP, p. 10).

Cross-country (off-road) vehicle travel is prohibited in Glen Canyon, including for permittees. Only established roads can be used.

VEGETATION

Objective 1

Maintain in upland (dry site) plant communities, as natural a community as possible, including the full range of native species, a viable seedbank, and minimal presence of increasing undesirable species (BLM/NPS) (GzMP, p. 12).

Actions

The following items are actions that may be taken to attain the desirable targets and accomplish Objective 1 (GzMP, pp. 13-15).

6. Establish trend plots in key areas to determine successional trend and ecological status.
7. Establish grazing exclosures in key areas through consultation with the BLM to determine long term effects and recovery from livestock grazing, as well as how climate affects species growth and abundance.

Objective 2

To protect healthy populations of special status species, including federally listed threatened and endangered species, federal candidate C1 and former C2 species, and state heritage ranked rare and sensitive species (NPS/USFWS) (GzMP, p. 15).

Actions

1. Determine population biology and ecology of species to assess if grazing causes significant impacts to populations.
3. If impacts are discovered and the species or populations require protection, determine the best method, including but not limited to fencing, changes in grazing seasons or pasture rotations, or removal of grazing.

Objective 3
Manage and protect scientifically important areas and hanging gardens to prevent grazing induced changes (NPS) (GzMP, p. 12).

Actions
Sensitive plant communities of importance for scientific research will not be subject to livestock grazing impacts (GzMP, p. 16).

1. Prioritize areas according to immediacy of threats, and importance of resource to Glen Canyon.
2. Determine if Research Natural Area, Protected Natural Area, or Experimental Research Area designation, and/or fencing is most appropriate to protect the site.

Objective 4
Protect wetlands, riparian zones, and spring and seep vegetation (NPS/BLM) (GzMP, p. 16).

Actions
For key riparian reaches in high priority or non-M[aintenance] allotments, maintain populations of all native species and specific conditions detailed below (GzMP, pp. 16-17).

1. Streambank alteration (e.g. bank collapse, loss of vegetation) shall not exceed 25% for streambanks in key areas.
2. Browse (of previous years growth) and forage utilization (of current years growth) shall not exceed 30% in key areas.
3. Reduce abundance of undesirable species to low levels (<5%) in areas where present (show declines through monitoring), and prevent establishment of undesirable species in areas where they are currently not present (see Table 9, Appendix C in GzMP).
4. Establish monitoring transects for vegetation status and trend determination in areas currently not meeting desirable conditions.
5. Adjust stocking rates, rest periods, reduce length of season, change season of use, or remove livestock until desirable conditions are met.

Objective 5
Determine the current status and trend of the grazed rangelands in Glen Canyon (NPS/BLM) (GzMP, p. 17).

Actions
Baseline data are not available for all grazed portions of Glen Canyon. This objective is designed to provide data essential for proper management of grazing activities and proper use of annual forage production. The results of this work may indicate changes are necessary in potential natural community composition (GzMP, p. 17).

Complete classification and inventory of the ecological status and successional trend of the upland vegetation in Glen Canyon using the methods and steps outlined below.

1. Compile and analyze existing data.
2. Inventory the current status of the upland arid and semi-arid vegetation, including species richness, diversity, structure, and successional status.
3. Establish permanent monitoring transects to determine future trends.
4. Establish permanent photographic points in association with permanent transects.
5. Revise the current vegetation classification for the recreation area, incorporating new data.
6. Establish baseline community classification criteria to direct management of grazing.

Soils

The evolutionary and ecological processes of the soil (abiotic) ecosystem, which includes surface cover, microbial populations, soil nutrient cycling and physical/chemical transformations, are critical to the protection of scientific processes and scenic values within Glen Canyon (GzMP, p. 17).

Objective 2

Enhance soil productivity and surface cover by promoting deposition of sufficient cover and litter to protect the soil from excessive water and wind erosion, and to promote infiltration (NPS) (GzMP, p. 18).

Water Quality

Goal

Maintain water quality in all natural bodies of water and sources of water (does not include stock ponds or reservoirs) and maintain natural flows to preserve water dependent resources. At a minimum, water quality standards will meet the Utah State water requirements of 303(d) and 317(e) as defined in the standards and guidelines (Appendix B) (GzMP, p. 18).

Objective 1

In all natural surface waters accessible for public use, water quantity and quality including physical/chemical parameters of flow, temperature, conductivity, pH, turbidity, salinity, dissolved oxygen, suspended and dissolved solids, and nutrients will not be degraded (NPS) (GzMP, p. 18).

Objective 2

Bacteriological levels for fecal coliform in natural surface waters will not exceed standards for recreational use (NPS) (GzMP, p. 19).

Objective 3

Preserve naturally occurring aquatic species diversity, composition and abundance (NPS) (GzMP, p. 19).

Objective 4

Maintain integrity of stream morphology, instream flows, riparian zone, and springs' natural emergence (NPS/BLM) (GzMP, p. 19).

Objective 6

Ensure access to water sources for wildlife and recreational uses (GzMP, p. 19).

WILDLIFE

The terrestrial and aquatic wildlife resources of Glen Canyon are an integral part of the desert ecosystem to be experience and enjoyed by visitors to the recreation area. These wildlife resources, which the NPS is charged to protect and preserve for the enjoyment of future generations, have intrinsic and scientific value (GzMP, p. 19).

Goal

Maintain components and processes of natural ecosystems, including the natural abundance, diversity and ecological integrity of the wildlife and fish (GzMP, p. 19).

Objective 1

Protect federally listed and other special status species and their critical or required habitat (NPS/USFWS) (GzMP, p. 19)

Objective 2

Maintain the natural abundance and diversity of bird species (NPS) (GzMP, p. 19).

Objective 3

Maintain or establish populations of wild mammals where suitable habitat exists (NPS) (GzMP, p. 19).

Objective 4

Maintain the natural abundance and diversity of herpetofauna (NPS) (GzMP, p. 19).

Desirable Conditions for Glen Canyon Wildlife Actions for Objectives 1 - 5

Wildlife species will not be subject to grazing if studies show that significant impacts occur.

1. Consult with the US Fish and Wildlife Service on federally listed and candidate species.
2. Determine through research and monitoring studies the status of those wildlife species of concern in grazed allotments and pastures.
3. If impacts to wildlife populations are found, determine the best way to maintain healthy populations, including but not limited to fencing, changes in grazing season or rotation, adjustments in AUMs, or changes in vegetation utilization or other vegetation action items.

Objective 6

Minimize the competition between livestock and wildlife. Consider livestock interactions and disease transmission (NPS/BLM) (GzMP, p. 20).

Objective 7

General predator control activities will not be permitted. Based on documented predator activity that identifies an individual animal, or limited number of individual animals, a specific control action may be authorized by the NPS (NPS) (GzMP, p. 20).

Objective 8
Feral or trespass animals will be removed (BLM/NPS) (GzMP, p. 20).

CULTURAL RESOURCES

Cultural resource properties are irreplaceable and non-renewable resources with scientific, cultural, educational, and interpretive value (GzMP, p. 20).

Goal
Protect and preserve the scientific value, and foster appreciation for, the cultural resources and their settings within Glen Canyon. This protection and preservation extends to both prehistoric and historic cultural resources as well as Traditional Cultural Properties (GzMP, p. 22).

Objective 1
Protect cultural resources within the Primary and Secondary Area of Impact (GzMP, p. 22).

A cultural resources inventory of the Primary Area of Impact will be conducted on high priority projects and ground disturbing activities. The Primary Area of Impact is the area directly affected by a proposed activity, and includes an additional buffer area to account for possible resource damage experienced during implementation of the proposed activity. If the proposed activity in the Primary Area of Impact is a water development project, a Secondary Area of Impact will also be inventoried. This Secondary Area of Impact includes a minimum of up to a 2 mile radius around the water development site, which is the average daily range of livestock from their water source in cool weather.

The inventory will include both a Class I literature search for previously identified cultural resources, and a Class III intensive survey of the impact areas. Transects, 15 to 20 meters wide, will be walked until the entire Primary, and if necessary, the Secondary Area of Impact has been inspected. Located sites will be plotted on appropriate 7.5 minute topographic quads and recorded using a global positioning system to ensure accurate georeferencing.

Objective 2
All alcove sites identified within the Primary and Secondary Area of Impact will be protected from damage or loss due to livestock grazing activities (fenced; GzMP**{** XE "Grazing Management Plan, Glen Canyon (GzMP 1999)" **}**, p. 22).

All alcove sites identified within the Primary and Secondary Area of Impact will be documented using the appropriate Intermountain Antiquities Computer System forms. Site condition evaluation, photo documentation, field and feature sketches, site mapping, artifact collections, and topographic plotting will be performed as appropriate. Alcove sites may be fenced or other action taken to prevent access to livestock. Prior to beginning any fencing activity, a Section 106 compliance will be required.

Objective 3
All open surface sites identified within the Primary and Secondary Area of Impact will be protected from damage or loss due to livestock grazing activities (NPS) (GzMP, p. 22).

All open surface sites identified within the Primary and Secondary Area of Impact will be documented using the appropriate Intermountain Antiquities Computer System forms. Site condition evaluation, photo documentation, field and feature sketches, site mapping, artifact collections, and topographic plotting will be performed as appropriate. Open surface sites may be fenced or other action taken to prevent access to livestock. Prior to beginning any fencing activity, a Section 106 compliance will be required.

Objective 4
All historic sites identified within the primary and secondary areas of impact will be protected from damage or loss due to livestock grazing activities (NPS) (GzMP, p. 22).

All historic sites identified within the Primary and Secondary Area of Impact will be documented using the appropriate Intermountain Antiquities Computer System forms. Site condition evaluation, photo documentation, field and feature sketches, site mapping, artifact collections, and topographic plotting will be performed as appropriate. Historic sites may be fenced or other action taken to prevent access to livestock. Prior to beginning any fencing activity, a Section 106 compliance will be required.

Objective 5
All rock art sites identified within the Primary and Secondary Areas of Impact will be protected from damage or loss due to livestock grazing activities (NPS; GzMP{ XE "Grazing Management Plan, Glen Canyon (GzMP 1999)" }, pp. 22-23).

All rock art sites identified within the Primary and Secondary Area of Impact will be documented using the appropriate Intermountain Antiquities Computer System forms. Site condition evaluation, photo documentation, field and feature sketches, site mapping, artifact collections, and topographic plotting will be performed as appropriate. Rock art sites may be fenced to prevent access to livestock. Prior to beginning any fencing activity, a Section 106 compliance will be required.

Objective 6
Mitigate potential impacts to cultural resources not protected in situ. This mitigation includes the curation of artifacts and other materials collected during mitigation efforts (NPS) (GzMP, p. 23).

Objective 7
American Indian traditional, cultural, or ceremonial sites will be identified and protected (NPS) (GzMP, p. 23).

No ground disturbing activities will be authorized until a determination has been made that no traditional cultural properties will be affected. If potential impacts to a traditional cultural property occur, formal consultation with Native American Tribes will be done.

Paleontological and Quaternary Resources

Dinosaur trackways found in the Morrison formation, shark teeth in the Mancos shale, and Quarternary Period resources including packrat middens and preserved faunal and floral remains are irreplaceable scientific resources (GzMP, p. 24).

Goal

Preserve paleontological and quaternary resources in-situ or insure full data recovery and curation of recovered specimens (GzMP, p. 24).

Objective 1

A literature search and first order survey to locate and record paleontological and quaternary resources will be completed prior to ground disturbing activities (GzMP, p. 24).

Scenic Resources

Glen Canyon contains magnificent scenic vistas. Deep canyons, sheer cliffs, distant mountain ranges, colorful soils and vegetation, and a unique collection of mesas, buttes, and spires all form a mosaic of visual enchantment for the visitor specifically identified for protection in the enabling legislation (GzMP, p. 24).

Goal

Maintain scenic resources (GzMP, p. 26).

Objective 1

No long-term loss of scenic resources (NPS) (GzMP, p. 26).

Potential impacts to scenic views will be evaluated based on the seven elements [see GzMP, p. 25]. Required mitigation such as location of improvements so that they do not affect the scene may be utilized. Determine "Visual Absorption Capability" and "Visual Vulnerability" of the affected scenic resources and do not permit impacts that diminish visual quality to include a determination of the area's ability to recover from the impact. (Desert landscapes are fragile and susceptible to long-term degradation from short-term activities.)

Objective 2

Identify and protect cultural landscapes (NPS) (GzMP, p. 26).

Objective 3

Protect critical scenic resources in areas of heavy recreation use such as access road corridors, trailheads, major backcountry vehicle routes, boat accessible beach camping locations and developed scenic overlook viewsheds. In these critical scenic resource areas effects of grazing will be minimized so that vegetative components of the scene will be maintained (NPS) (GzMP, p. 26).

Recreational Resources

Glen Canyon was established "…in order to provide for public outdoor recreation use and enjoyment of Lake Powell and lands adjacent thereto in the States of Arizona and Utah." Millions of visitors use the recreation area each year. There are millions of recreation overnights on the shores of Lake Powell and in the backcountry (GzMP, p. 26).

Goal

Protect recreation resources and the visitor experience (enjoyment and use) by reducing or mitigating recreation/livestock conflicts (GzMP, p. 27).

Objective 1

Prevent or reduce livestock/recreation conflicts so that recreational use and enjoyment of the recreation area is not impaired (GzMP, p. 27.)

This page intentionally left blank.

Chapter 4
Environmental Consequences

TABLE OF CONTENTS

Chapter Page

TABLES — Page

4. Environmental Consequences

DO NOT DELETE THIS PAGE from the MS Word file, as this is what marks Heading 1 for the table of contents. (Do delete this page later from the Adobe Acrobat [pdf] file.)

THROW THIS PAGE AWAY & DELETE FROM PDF

CHAPTER 4
ENVIRONMENTAL CONSEQUENCES

4.1 INTRODUCTION

This chapter presents the likely direct, indirect, and cumulative impacts on the human and natural environment that would occur from implementing the alternatives presented in **Chapter 2**, Alternatives. As with **Chapter 3**, Affected Environment, this chapter is organized by topic. Each topic area includes a methods of analysis section that contains the following:

- Methods and assumptions
- Factors for analysis
- A discussion of the nature and type of impacts
- A summary of impacts common to all alternatives and an analysis of direct and indirect impacts of each of the five alternatives
- A description of cumulative impacts

Separate sections describing irretrievable or irreversible commitment of resources, and the relationship between local short-term uses and long-term productivity, are presented at the end of the chapter.

The section on methods and assumptions assesses impacts specific to the resource or resource use. These are in addition to those general assumptions and methods listed in **Sections 4.1.1**, Analytical Assumptions, and **4.1.2**, General Method for Analyzing Impacts. Factors for analysis are those that describe resource condition and change and can help determine trends over time. The nature and type of impacts section describes in general terms the types of impacts on resources or resource uses from livestock grazing and related management described in the alternatives. Impacts of each alternative describe how the factors for analysis would change the magnitude of the nature and type of impact (context and intensity).

Nearly all management actions proposed in **Chapter 2** are planning-level decisions, rather than implementation decisions, and do not result in direct, on-the-ground changes. However, over the long term, decisions could result in on-the-ground changes. Some management actions may

affect only certain resources under certain alternatives. This impact analysis identifies impacts that may enhance or improve a resource as a result of management actions, as well as those impacts that have the potential to impair a resource. However, the evaluations are confined to the actions that have direct, immediate, and more prominent impacts. If an activity or action is not addressed in a given section, no impacts are expected, or the impact is expected to be negligible, based on professional judgment.

To ensure that the BLM meets its mandate of multiple use in land management actions under the Federal Land Policy and Management Act{ XE "Federal Land Policy and Management Act (FLPMA)" } (FLPMA) of 1976, the impacts of the alternatives on resource uses are identified and assessed as part of the planning process. The projected impacts on land use activities and the environmental impacts of land uses are characterized and evaluated for each of the alternatives.

Impact analysis is a cause-and-effect process. Detailed impact analyses and conclusions are based on the planning team's knowledge of resources and the project area, reviews of existing literature, and information provided by experts in the BLM, other agencies, interest groups, and citizens. The baseline used for the impact analysis is the current condition or situation, as described in **Chapter 3**. Impacts on resources and resource uses are analyzed and discussed in detail, commensurate with resource issues and concerns identified throughout the process. Occasionally, impacts are described using ranges of potential impacts or in qualitative terms.

4.1.1 Analytical Assumptions

Several assumptions were made to facilitate the analysis of the projected impacts. These assumptions set guidelines and provide reasonably foreseeable projected levels of use that would occur within the planning area during the planning period. These assumptions should not be interpreted as constraining or redefining the management objectives and actions proposed for each alternative, as described in **Chapter 2**. Any specific resource assumptions are provided in the ***Methods of Analysis*** section for that resource.

The following general assumptions apply to all resource categories.

- Each alternative in Chapter 2 constitutes a possible MMP{ XE "Monument Management Plan, Grand Staircase-Escalante National Monument (MMP 2000)" }-A and would be implemented.
- Implementing actions from any of the MMP{ XE "Monument Management Plan, Grand Staircase-Escalante National Monument (MMP 2000)" }-A alternatives would be in compliance with all valid existing rights, federal regulations, BLM and NPS policies, and other requirements.
- Implementation-level actions necessary to execute the land use plan-level decisions in this MMP{ XE "Monument Management Plan, Grand Staircase-Escalante National Monument (MMP 2000)" }-A would be subject to further environmental review, including NEPA{ XE "National Environmental Policy Act (NEPA)" } analysis, as appropriate.
- Direct and indirect impacts of implementing the MMP{ XE "Monument Management Plan, Grand Staircase-Escalante National Monument (MMP 2000)" }-A primarily

occur on the decision area lands, unless a different area of analysis is identified for a particular resource or resource use.

- Local climate patterns of historical record and related conditions for plant growth may change with warmer, drier conditions likely to occur throughout the life of the MMP{ XE "Monument Management Plan, Grand Staircase-Escalante National Monument (MMP 2000)" }-A.[1]
- In the future, as tools for predicting climate change in the planning area improve and changes in climate affect resources and necessitate changes in how resources are managed, the BLM may reevaluate decisions made as part of this planning process and adjust management accordingly.
- The discussion of impacts is based on the best available data and science. Knowledge of the planning area and professional judgment, based on observation and analysis of conditions and responses in similar areas, are used to infer environmental impacts where data are limited.
- There are 29,245 AUMs in a suspended{ XE "Suspension" } use category. During permit renewal, it is possible for the BLM to reactivate the suspended AUMs, based on range conditions that support additional AUMs. Because this is a permit-level action, the analysis below is based on the active permitted use, which, under Alternative D, would reactivate the suspended AUMs.
- Data from geographic information systems (GIS) have been used in developing acreage calculations and to generate the figures in this EIS. Calculations depend on the quality and availability of data. Most calculations in this MMP{ XE "Monument Management Plan, Grand Staircase-Escalante National Monument (MMP 2000)" }-A are rounded to the nearest 100 acres or 0.1 mile. Given the scale of the analysis, the compatibility constraints between datasets, and the lack of data for some resources, all calculations are approximate and are for comparison and analytical purposes only. Likewise, the figures are provided for illustrative purposes and are subject to the limitations discussed above. The BLM may receive additional GIS data; therefore, acreages may be recalculated and revised.
- Acreage figures and other numbers used are approximate projections; readers should not infer that they reflect exact measurements or precise calculations. Acreages were calculated using GIS technology, and there may be slight variations in total acres between resources.

4.1.2 General Method for Analyzing Impacts

Potential impacts are described in terms of type, context, duration, and intensity, which are generally defined as follows:

[1] S. A. Bryce, J. R. Strittholt, B. C. Ward, and D. M. Bachelet. 2012. Colorado Plateau Rapid Ecoregional Assessment Report. Prepared for the US Department of the Interior, Bureau of Land Management. Denver, Colorado.

- *Type of Impact*—The analysis discloses impacts, beneficial and adverse, and, where relevant, whether they would be short term or long term. The presentation of impacts for key planning issues{ XE "Planning Issues" } is intended to provide the BLM decision-maker and reader with an understanding of the multiple use tradeoffs associated with each alternative.
- *Context*—Context describes the area or location (site-specific, local, planning area-wide, or regional) in which the impact would occur. Site-specific impacts would occur at the location of the action, local impacts would occur in the general vicinity of the action area, planning area-wide impacts would affect a greater portion of the planning area, and regional impacts would extend beyond the planning area boundaries.
- *Duration*—Duration describes the length of time an impact would occur, either short term or long term. Short term is defined as anticipated to begin and end within the first 5 years after the action is implemented. Long term is defined as lasting beyond 5 years to the end of or beyond the life of the MMP{ XE "Monument Management Plan, Grand Staircase-Escalante National Monument (MMP 2000)" }-A. For some resources, such as air quality and socioeconomics, a 20-year time frame was used to assess long-term impacts.
- *Intensity*—Rather than categorize impacts by intensity (e.g., major, moderate, and minor), this analysis discusses impacts using quantitative data wherever possible.
- *Direct and Indirect Impacts*—Direct impacts are caused by an action or implementation of an alternative and occur at the same time and place. Indirect impacts result from implementing an action or alternative but usually occur later in time or are removed in distance and are reasonably certain to occur.
- *Cumulative Impacts*—As described in the cumulative impacts subsection for each resource or resource use, these are the direct and indirect impacts of a proposed project alternative's incremental impacts when they are added to other past, present, and reasonably foreseeable actions, regardless of who carries out the action (40 CFR, Subpart 1508.7). The list of actions used for cumulative impact analysis is provided in **Section 4.2.2**, Past, Present, and Reasonably Foreseeable Future Actions.

For ease of reading, impacts presented are direct and long term and occur within the larger planning area, unless they are noted as indirect, short term or temporary, or localized. Analysis shown under Alternative A may be referenced in the other alternatives with such statements as "impacts would be the same as, or similar to, Alternative A" or "impacts would be the same as Alternative A, except for . . .," as applicable.

While the factors for analysis used vary by resource and resource use, the varying factors themselves are affected by similar management actions due to the targeted focus of this MMP{ XE "Monument Management Plan, Grand Staircase-Escalante National Monument (MMP 2000)" }-A on livestock grazing.

Most resources identify a factor for analysis of changes in density of AUMs for livestock (acres available per AUM). This is presented for both the projected average actual use and the active permitted use for each alternative. The average actual use is the expected level of use, based on historical use. The density of AUMs available for livestock, based on projected average actual use, varies slightly between 49 and 52 acres available per AUM. There are 52 acres available per AUM under Alternative E, 51 acres available per AUM for Alternative A, 50 acres available per AUM for Alternative D, and 49 acres available per AUM for Alternative C.

The densities do not vary much because AUMs identified under each alternative are primarily driven by areas available and unavailable for livestock grazing. Therefore, for example, under Alternative C, there is nearly a proportional reduction in AUMs available as there is in acres available for livestock grazing.

The same is true for the increase in AUMs and acres available under Alternative D. Therefore, the densities among Alternatives A, C, D, and E are similar. Furthermore, using this measure assumes that all acres available for livestock grazing in the decision area under any alternative are the same and that livestock would be evenly distributed in the available areas. There are, however, factors that limit livestock distribution, such as water availability, topography, and palatable forage. As a result, livestock would not be evenly distributed in the available areas but would congregate in the areas most desirable by livestock. Thus, patterns of livestock distribution would be similar under Alternatives A, C, D, and E.

The density of AUMs for livestock based on active permitted use shows more of a variation among the alternatives. Alternatives A and E each have a density of 27 acres available per AUM, Alternative C has a density of 26 acres available per AUM, and Alternative D has a density of 20 acres available per AUM. While this appears to be more of a variation in the alternatives, it still holds true that livestock would not be evenly distributed in the available areas but would congregate in the areas most desirable by livestock. Thus, patterns of livestock distribution would be similar under Alternatives A, C, D, and E. Recognizing that livestock will continue to distribute themselves in similar patterns to their current use, active permitted use is more reflective of the magnitude of impact under the alternatives.

4.1.3 Incomplete or Unavailable Information

The CEQ{ XE "Council on Environmental Quality (CEQ)" } established implementing regulations for NEPA{ XE "National Environmental Policy Act (NEPA)" }. They require federal agencies to identify relevant information that may be incomplete or unavailable for an evaluation of reasonably foreseeable significant adverse impacts in an EIS (40 CFR, Subpart 1502.22). If the information is essential to a reasoned choice among alternatives, it must be included or addressed in an EIS. Knowledge and information is, and would always be, incomplete, particularly with infinitely complex ecosystems considered at various scales.

The best available information pertinent to the decisions to be made was used in developing the MMP{ XE "Monument Management Plan, Grand Staircase-Escalante National Monument (MMP 2000)" }-A. Effort has been taken to acquire and convert resource data from the BLM, NPS, and outside sources into digital format for use in the MMP-A.

Certain information was unavailable for use in developing this MMP{ XE "Monument Management Plan, Grand Staircase-Escalante National Monument (MMP 2000)" }-A because inventories have either not been conducted or are incomplete. Some of the major types of data that are incomplete or unavailable are the following field inventories:

- Soils and water conditions
- Vegetation composition
- Wildlife and special status species occurrence and condition
- Cultural and paleontological resources{ XE "Paleontological Resource" }

For these resources, estimates were made concerning their number, type, and significance, based on previous surveys and existing knowledge. In addition, some impacts cannot be quantified given the proposed management actions. Where this gap occurs, impacts are projected in qualitative terms or, in some instances, are described as unknown. Subsequent project-level analysis will provide the opportunity to collect and examine site-specific inventory data required to determine appropriate application of MMP{ XE "Monument Management Plan, Grand Staircase-Escalante National Monument (MMP 2000)" }-level guidance. In addition, ongoing inventory efforts by the BLM, NPS, and other agencies in the planning area continue to update and refine information used to implement this MMP-A.

4.2 Cumulative Impacts

Cumulative impacts are those on the environment that result from implementing any one of the MMP{ XE "Monument Management Plan, Grand Staircase-Escalante National Monument (MMP 2000)" }-A alternatives, in combination with other actions outside the scope of this MMP-A, either within the planning area or adjacent to it.

Cumulative impacts analysis is required by CEQ{ XE "Council on Environmental Quality (CEQ)" } regulations because environmental conditions result from many different factors that act together. The total impact of any single action cannot be determined by considering it in isolation; instead, it must be determined by considering the likely result of that action in conjunction with many others.

An evaluation of potential impacts considers incremental impacts that could occur from the proposed project, as well as impacts from past, present, and reasonably foreseeable future actions. Management actions could be influenced by activities and conditions on adjacent BLM-managed lands and those not managed by the BLM beyond the planning area boundary; therefore, assessment data and information could span multiple scales, landownerships, and jurisdictions. These assessments involve determinations that often are complex and, to some degree, subjective.

4.2.1 Cumulative Impacts Analysis Method

The cumulative impacts discussion that follows considers the alternatives in the context of the broader human environment, specifically, actions that occur outside the scope and geographic area covered by the MMP{ XE "Monument Management Plan, Grand Staircase-Escalante

National Monument (MMP 2000)" }-A. An analysis of cumulative impacts is limited to important issues of national, regional, or local significance; therefore, not all resources identified for the direct and indirect impact analysis in this EIS are analyzed for cumulative impacts.

Because of the programmatic nature of an MMP{ XE "Monument Management Plan, Grand Staircase-Escalante National Monument (MMP 2000)" }-A and cumulative assessment, the analysis tends to be broad and generalized to address impacts that could occur from a reasonably foreseeable management scenario, combined with other reasonably foreseeable activities or projects. Consequently, this assessment is primarily qualitative for most resources because of lack of detailed information that would result from project-level decisions and other activities or projects. Quantitative information is used whenever available and as appropriate to portray the magnitude of an impact.

The analysis assesses the magnitude of cumulative impacts by comparing the environment in its baseline condition with the expected impacts of the alternatives and other actions in the same geographic area. The magnitude of an impact is determined through a comparison of anticipated conditions against the baseline, as depicted in the affected environment (see **Chapter 3**) or the long-term sustainability of a resource or social system.

The following factors were considered in this cumulative impacts assessment:

- Federal and nonfederal government actions, and private actions
- Potential for combined impacts or interaction among or between impacts
- Potential for impacts on cross political and administrative boundaries
- Other spatial and temporal characteristics of each affected resource
- Comparative scale of cumulative impacts across alternatives

Temporal and spatial boundaries used in the cumulative analysis are developed on the basis of resources of concern and actions that might contribute to an impact. The baseline year for the cumulative impacts analysis is 2016; the timespan of this analysis is the life of the MMP{ XE "Monument Management Plan, Grand Staircase-Escalante National Monument (MMP 2000)" }-A.

Spatial boundaries vary and are larger for resources that are mobile or migrate, such as big game populations, compared with stationary resources. Occasionally, spatial boundaries could be within the planning area or in an area within the planning area. Spatial boundaries were developed to facilitate the analysis and are included under the appropriate resource section heading.

4.2.2 Past, Present, and Reasonably Foreseeable Future Actions

Past, present, and reasonably foreseeable future actions are considered in the analysis to identify whether and to what extent the environment has been degraded, maintained, or enhanced. They also are considered to gauge whether ongoing activities are causing impacts and trends for activities in and impacts on the area. Projects and activities are evaluated on the basis of proximity, connection to the same environmental systems, potential for subsequent impacts or

activity, potential for similar impacts, the likelihood a project will occur, and whether the project is reasonably foreseeable.

Projects and activities considered in the cumulative analysis were identified through meetings held with cooperating agencies and BLM and NPS employees with local knowledge of the area. Each was asked to provide information on the most influential past, present, or reasonably foreseeable future actions.

Impacts of past actions and activities are manifested in the current condition of the resources, as described in the affected environment (see **Chapter 3**). Reasonably foreseeable future actions are those that have been committed to or known proposals that could take place within the 20-year planning period.

Reasonably foreseeable action scenarios are projections made to predict future impacts; they are not actual planning decisions or resource commitments. Projections, which have been developed for analytical purposes only, are based on current conditions and trends and represent a best professional estimate. Unforeseen changes in factors such as economics, demand, and federal, state, and local laws and policies could result in different outcomes than those projected in this analysis.

Other potential future actions have been considered and eliminated from further analysis for one of the following reasons:

- Because there is a small likelihood that the actions would be pursued and implemented within the life of the MMP{ XE "Monument Management Plan, Grand Staircase-Escalante National Monument (MMP 2000)" }-A
- Because so little is known about the potential action that formulating an analysis of impacts would be premature

In addition, potential future actions protective of the environment, such as new regulations related to fugitive dust emissions, have less likelihood of creating major environmental consequences alone or in combination with this planning effort. Federal actions, such as species listing under the ESA{ XE "Endangered Species Act (ESA)" }, may require the BLM to reconsider decisions in this MMP{ XE "Monument Management Plan, Grand Staircase-Escalante National Monument (MMP 2000)" }-A. This is because the consultations and relative impacts might no longer be appropriate. These potential future actions may have greater capacity to affect resource uses within the planning area; however, until more information is developed, no reasonable estimation of impacts could be developed.

Data on the precise locations and overall extent of resources within the planning area are considerable, although the information varies according to resource type and locale. Furthermore, understanding of the impacts on and the interplay among these resources is evolving. As knowledge improves, management measures (adaptive or otherwise) would be considered to reduce potential cumulative impacts in accordance with laws, regulations, and the approved MMP{ XE "Monument Management Plan, Grand Staircase-Escalante National Monument (MMP 2000)" }.

Projects and activities identified as having the greatest likelihood to generate potential cumulative impacts, when added to the MMP{ XE "Monument Management Plan, Grand Staircase-Escalante National Monument (MMP 2000)" } alternatives, are displayed in **Table 4-1**.

Table 4-1
Past, Present, and Reasonably Foreseeable Projects, Plans, or Actions that Comprise the Cumulative Impact Scenario

General	*Establishment of GSENM and Monument Proclamation.* GSENM was established in 1996 by the president under the authority of the 1906 Antiquities Act. It was established to protect the objects identified in the proclamation.
	Establishment of Glen Canyon National Recreation Area and enabling legislation. In 1972, Congress passed Glen Canyon's enabling legislation (Public Law 92-593). As described in the enabling legislation, the purpose of the recreation area is "to provide public outdoor recreation use and enjoyment of Lake Powell and lands adjacent thereto…and to preserve and protect the scenic, scientific, and historic features contributing to public enjoyment of the area."
Other land use plans	*BLM GSENM MMP{ XE* "Monument Management Plan, Grand Staircase-Escalante National Monument (MMP 2000)" } *(BLM 2000).* This plan set management, protection, and use goals and guidelines for GSENM.
	BLM KFO RMP (BLM 2008a), as amended. This plan sets management, protection, and use goals and guidelines for the BLM KFO, Utah.
Other land use plans *(cont.)*	*BLM ASFO RMP (BLM 2008b), as amended.* This plan sets management, protection, and use goals and guidelines for the BLM ASFO, Arizona.
	Glen Canyon GMP{ XE "General Management Plan, Glen Canyon (GMP 1979)" } *(NPS 1979).* This plan identified the primary management zones and objectives for Glen Canyon and established the park road system.
	Glen Canyon GzMP{ XE "Grazing Management Plan, Glen Canyon (GzMP 1999)" } *(NPS 1999).* To give further clarity to the Glen Canyon values and purposes, with respect to grazing practices across the recreation area, a grazing component (the GzMP) of the GMP{ XE "General Management Plan, Glen Canyon (GMP 1979)" } was developed and signed in 1999. This plan was to be a foundational document to give management direction for the future of grazing practices across the recreation area. It was made to be flexible, allowing new data and methods to be incorporated into the determinations of park values and resource conditions and the management of livestock practices.
	Capitol Reef National Park Livestock Grazing and Trailing Management Plan and EIS. The plan will guide livestock grazing management and trailing within Capitol Reef National Park.
	Utah Code, Title 63J, Chapter 8, State of Utah Resource Management Plan for Federal Lands. Within this chapter, Section 105.8 established the Utah Grazing Agricultural Commodity Zones. The Escalante Region Grazing Zone is one of many grazing zones across Utah. Their purpose is as follows: • Preserving and protecting the agricultural livestock industry from ongoing threats • Preserving and protecting the history, culture, customs, and economic value of

Table 4-1
Past, Present, and Reasonably Foreseeable Projects, Plans, or Actions that Comprise the Cumulative Impact Scenario

	the agricultural livestock industry from ongoing threats • Maximizing efficient and responsible restoration, reclamation, preservation, enhancement, and development of forage and watering resources for grazing and wildlife practices and affected natural, historical, and cultural activities
	Coconino County Comprehensive Plan. This plan was adopted in 2003 but is being revised. The plan addresses growth, conservation, and development and includes a section on preserving ranches and ranchlands in the county.
	*Garfield County General Management Plan***{** *XE* "General Management Plan, Glen Canyon (GMP 1979)" **}** *(adopted November 8, 2007).* This plan establishes criteria, policies, and requirements to be met in the federal land use planning process. It documents baseline conditions for analysis and states that, where quantified data is not available, professional judgment must defer to policies and objectives outlined in the Garfield County Resource Management Plan. A 2013 amendment addresses the cultural and historic value of grazing and places the Escalante Historic and Cultural Grazing Region on the County Register of Cultural and Historic Resources.
Other land use plans *(cont.)*	*Kane County General Plan (adopted June 22, 1998; last amended December 19, 2016).* This plan addresses growth, development, and partnerships with federal agencies in Kane County. It was amended in August 2014 to adopt the Escalante Region Multiple Use/Multiple Functions Grazing Zone in response to the public's concerns on grazing public lands versus on private lands and agricultural pursuits. The grazing zone emphasizes the social, economic, historic, and cultural importance of grazing to Kane County and its residents.
	Kane County Land Use Ordinance, Chapter 27, Escalante Region Multiple Use/Multiple Functions Grazing Zone (last amended September 22, 2014). Chapter 27 of the Kane County Land Use Ordinance establishes the Escalante Region Multiple Use/Multiple Functions Grazing Zone, which overlaps GSENM. The ordinance states that the purpose of providing a multiple use/multiple functions zone are to establish areas that are open and generally undeveloped lands where human habitation would be limited. The zone is designed to enhance and protect land and associated open space resources. It is established to encourage the use of land, where appropriate, for livestock grazing, wildlife habitat, and recreation, among other uses. This zone is established to protect all valid private property rights and the continued use and full access to these rights. This zone is intended to promote the health, safety, convenience, order, prosperity, and general welfare and economy of the inhabitants of Kane County, tourists, and future generations.
	Kane County Resource Management Plan (adopted June 22, 1998; last amended November 2016). This document establishes the County's resource development goals, objectives, and policies, in coordination with the County Land Use Authority. It addresses the County's current and future desired conditions for land use and development, grazing, and natural resource management. It was also amended by the Escalante Region Multiple Use/Multiple Functions Grazing Zone.
Livestock	Domestic livestock was introduced into southern Utah as a result of exploration and trade along the Spanish Trail, beginning in the late 1700s. With subsequent Euro-

Table 4-1
Past, Present, and Reasonably Foreseeable Projects, Plans, or Actions that Comprise the Cumulative Impact Scenario

grazing	American settlement in the late 1800s, grazing on lands currently administered by GSENM became well established; the number of cattle, sheep, and horses increased rapidly until the early 1900s. Grazing use in the region has substantially decreased from its peak in the early part of the twentieth century. Lands now managed by the BLM were treated as a commons in which those who moved their stock onto the range first each season secured the use of new forage growth. Stock animals from across the region were brought to graze during the winter, and many were left on the range year-round. This period of unregulated use and overgrazing resulted in impacts on rangeland resources and ecological conditions, especially at lower elevations used for winter grazing. The passage of the Taylor Grazing Act{ XE "Taylor Grazing Act" } in 1934 secured federal control of the winter ranges. During the following years, the federal government established regulations pertaining to permittees, allotments, kind and number of livestock, and season of use on public land. During the late 1950s and early 1960s, the BLM completed range surveys to determine the capacity of the land for grazing. Following these surveys, the BLM adjudicated decisions on forage and reduced livestock numbers on most allotments.
Livestock grazing *(cont.)*	A federal court order on April 11, 1975, required the BLM to prepare grazing EISs during a 10-year period. To comply with this order, the BLM conducted range suitability analyses and field surveys on grazing capacity between 1975 and 1979. In 1980, the BLM issued the Kanab/Escalante Grazing Final EIS and began making adjustments in number and season of use of livestock. The EIS allocated 68,298 AUMs to livestock initially and 91,444 AUMs on full implementation of the plan, which was identified as being 24 years later, or 2005. Forage{ XE "Forage" } production was to be increased by increasing production of desirable vegetation, improving watershed conditions and wildlife habitat, and with vegetation treatments{ XE "Vegetation Treatment" } and rangeland developments, such as fences and water developments (BLM 1980). (Note that the planning area for the 1980 EIS included lands outside of the decision area for this MMP{ XE "Monument Management Plan, Grand Staircase-Escalante National Monument (MMP 2000)" }-A/EIS.) When GSENM was designated in 1996, there were approximately 77,400 active AUMs. Actual use that year was approximately 51,900 AUMs, or 67 percent of active AUMs. Today, there are 76,957 active AUMs, with actual use averaging just over 41,000 AUMs. Because the BLM made some allotments unavailable for livestock grazing under the 1999 Escalante MFP, the total permitted AUMs were greater in 1996 than they are today.
	Nonstructural range improvements{ *XE* "Range Improvement" }. Existing rangeland seedings{ XE "Seeding" } were originally completed throughout the planning area to provide forage for livestock, to reduce erosion, and to enhance watershed functionality. A rangeland seeding is a type of nonstructural range improvement where a vegetation type or community has been established, typically, through the artificial dissemination of seed and by clearing away vegetation. The original seedings were typically monocultures of crested wheatgrass or Russian wild rye. Seedings that are more recent have consisted of a mixture of native and nonnative species that include shrubs, forbs, and grasses.

Table 4-1
Past, Present, and Reasonably Foreseeable Projects, Plans, or Actions that Comprise the Cumulative Impact Scenario

	Currently in GSENM, vegetation treatments{ XE "Vegetation Treatment" } in seedings{ XE "Seeding" } are primarily intended to restore vegetation communities and wildlife habitat or to manage livestock use. Since the 1950s, the BLM has completed nonstructural range improvements{ XE "Range Improvement" } on approximately 4 percent of the decision area. The BLM typically has maintenance responsibility for seedings, although some are no longer functioning at a desired ecological level in the Upper Paria, Last Chance, Circle Cliffs, Vermilion, Mollies Nipple, Coyote, Cottonwood, and Headwaters allotments. The BLM has treated some of the failed seedings in order to restore them, with varying levels of success. The BLM bases current forage allocations on the presence and maintenance of these seedings. The failure of some of these seedings is partially responsible for actual use levels below permitted use. In Glen Canyon, nonstructural range improvements{ XE "Range Improvement" } are not permitted, according to the 1993 Interagency Agreement between the BLM and NPS for grazing management and the NPS Management Policies 2006 (NPS 2006).
Livestock grazing *(cont.)*	*Structural range improvements*{ *XE* "Range Improvement" }. Structural range improvements are fences, corrals, stock trails, line cabins, cattle guards, and water developments. In general, the BLM would not authorize a water development without a supporting water right held by the United States (IM UT-2015-019). There are approximately 1,200 existing structural range improvements in GSENM. In Glen Canyon, new line cabins are not permitted, according to the 1993 Interagency Agreement between the BLM and NPS for grazing management. Other structural range improvements{ XE "Range Improvement" } could be permitted, subject to 54 USC, Subsection 100101(a) et. seq., the Glen Canyon enabling legislation, the Glen Canyon GzMP{ XE "Grazing Management Plan, Glen Canyon (GzMP 1999)" } (NPS 1999), and the Glen Canyon GMP{ XE "General Management Plan, Glen Canyon (GMP 1979)" } (NPS 1979). The Glen Canyon superintendent first must complete a determination regarding the potential impacts of the proposed action on the values and purposes of Glen Canyon.
Vegetation management	In September 2015, the GSENM MMP{ XE "Monument Management Plan, Grand Staircase-Escalante National Monument (MMP 2000)" } was amended to include management direction to conserve, enhance, and restore greater sage-grouse{ XE "Greater Sage-Grouse" } and their habitat. Vegetation in areas within the planning area that have been identified as greater sage-grouse habitat will be maintained, as required. This may include removing evergreen trees and restoring sagebrush steppes (BLM 2015a). GSENM may also conduct future vegetation treatments{ XE "Vegetation Treatment" } for land health, wildlife habitat, or hazardous fuels reduction (BLM 2011). The Escalante River Watershed Project conducts Russian olive and tamarisk removal activities. Glen Canyon regularly conducts invasive vegetation management projects (mechanical removal of invasive species){ XE "Invasive Species" }, such as removing shoreline Revenna grass and Russian olive, restoration work along the Escalante River corridor, and continuing native plant restoration projects.

Table 4-1
Past, Present, and Reasonably Foreseeable Projects, Plans, or Actions that Comprise the Cumulative Impact Scenario

Recreation and visitor use	Recreation is a major use in GSENM. The number of people taking part in recreation has increased over the past decade and is expected to continue at a similar rate. In 2013, total visitation was 759,600, an increase of 35 percent since 2000 and the second highest number of yearly visitors since 1997 (BLM 2014). The BLM expects the most popular recreation activities in GSENM to continue to be pedestrian-based activities, such as hiking, walking, backpacking, and photographing, as well as motorized activities, particularly driving for pleasure. Despite an overall decline in visitor use to Glen Canyon, visitation in the planning area has increased over time, as more visitors discover this area, particularly since the designation of GSENM. Escalante Canyons, the Colorado River, above and below Lake Powell, the Escalante River, and other tributaries attract visitors to areas in the Glen Canyon portion of the planning area. Visitation to Glen Canyon as a whole has declined since a peak of 3.5 million visitors in 1992-1993. Total visitation fell below 2 million visitors from 2004 to 2009, but it has rebounded recently with approximately 2.4 million visitors in 2015 (NPS 2016), many of whom recreated on Lake Powell.
Recreation and visitor use *(cont.)*	*Glen Canyon Off-Road Vehicle Management Plan.* In 2017, the NPS released a final management plan for off-road vehicles (NPS 2017). The purpose of the plan is to evaluate off-road use by conventional and non-conventional motor vehicles and on-road use by nonconventional motor vehicles and to develop management actions that preserve Glen Canyon's scientific, scenic, and historic features; provide for the recreational use and enjoyment of the area; and promote the resources and values**{** XE "Resources and Values (Glen Canyon)" **}** for which the area was established as a unit of the National Park System.
	Unauthorized travel. Travel off of designated or existing routes and the creation of social trails has occurred and will likely continue within the decision area.
	Programmatic EA for Organized Group Activities along Hole-in-the-Rock Road. This is a joint programmatic EA between GSENM and Glen Canyon. It addresses organized group activities focused on heritage, cultural, and educational resources along Hole-in-the-Rock Road that exceed current management prescriptions for group size. The EA permits and manages organized group activities along the Hole-in-the-Rock Road corridor. It seeks to minimize impacts on cultural resources and protect visitor experience in connected primitive and undeveloped areas through the use of existing disturbed areas. The selected alternative allows a maximum of 145 people, 29 vehicles, and one predetermined camping location, requires sanitation facilities, and a three-day/two-night maximum stay. Glen Canyon Special Use Permits would be issued for these activities, and all permit conditions apply (BLM 2012).
	Calf Creek Recreation Area Site Improvements EA. This EA proposes improvements at developed portions of the recreation area. It is along Highway 12 in Garfield County, between Escalante and Boulder, Utah, on lands administered by GSENM. The project area is approximately 20 acres; it includes the Calf Creek campground and day use area and the Lower Calf Creek Falls trailhead. This developed portion of the Calf Creek Recreation Area is the most visited site on GSENM. The EA includes two action alternatives, with the following improvements: increase parking and camping capacity, move the day use area and construct new shade shelters, repair the suspension**{** XE

Table 4-1
Past, Present, and Reasonably Foreseeable Projects, Plans, or Actions that Comprise the Cumulative Impact Scenario

	"Suspension" } bridge, replace the low-water crossing with open-bottom box culverts, replace the toilets, improve access to the water play area, and install tent pads in all campsites. A decision is expected in early 2017 (BLM 2016).
Lands and realty	*Land Exchanges.* To further the protection of GSENM, the President asked the Secretary of the Interior to pursue agreements with the State of Utah to acquire the SITLA lands within GSENM and with the holders of two large coal leases in existence at the time GSENM was established. In late 1997, the State of Utah and the DOI successfully negotiated the largest state-federal land exchange in history, which Congress then ratified. This exchange transferred all state inholdings within GSENM, approximately 180,000 acres, to public ownership, administered by the BLM. In addition, in 1999, the BLM finalized agreements to purchase coal leases from two major lessees, eliminating coal development in GSENM. In Glen Canyon, the SITLA formerly managed approximately 40,000 acres, which it exchanged with the federal government in 1998 for lands outside of Glen Canyon.
Lands and realty *(cont.)*	*Garkane Transmission Right-of-Way (ROW).* The BLM is proposing to issue an amended ROW grant to Garkane Energy to upgrade the transmission line between the Buckskin substation and the Kanab and Fredonia substations from a 69 kilovolt line to a 138 kilovolt line. The Buckskin to Kanab and Fredonia transmission line project area is in Kane County, Utah, and Coconino County, Arizona. The existing and proposed transmission lines originate at the Buckskin substation and terminate at the Kanab and Fredonia substations. The Buckskin substation is approximately 30 miles northeast of Kanab, Utah, along US Highway 89. The transmission line alignment is on the south side of Highway 89, outside the Utah Department of Transportation ROW. The transmission line parallels Highway 89 for 25 miles, then branches west for about 2.9 miles to the Kanab substation and south for about 5.1 miles to the Fredonia substation. The proposed ROW would be 125 feet wide and 33 miles long. The 125-foot width is consistent with the Rural Utility Service Bulletin 1724-E-200 recommendations for power line ROW widths.
	South Central Buckskin to Page, Buried Fiber Optic Line. The BLM is proposing to issue a ROW grant to the South Central Communications (dba South Central Utah Telephone Association) for the installation of a buried fiber optic communications line. South Central Communications is seeking a ROW grant from the BLM for BLM-managed land crossed by the proposed line within the Utah Department of Transportation US-89 ROW, between the intersection of Five Mile Mountain Road and US Highway 89, to a point within Section 6 of Township 43S Range 1E. The total length of the project would be approximately 192,950 feet (36.5 miles), with a permanent ROW width of 10 feet, totaling approximately 44.3 acres. Of the total length, approximately 14.7 linear miles of fiber line and 17.8 acres of permanent ROW are proposed on GSENM-administered land, and an approximately 0.24 linear mile of fiber line and 0.3 acre of permanent ROW are proposed on KFO-administered land. During the construction phase of the project, the authorization would include a temporary additional ROW width of 5 feet to allow space for equipment to work. The NPS is also proposing to issue a ROW permit to South Central Communications for the portion of the project that crosses NPS-managed lands. The ROW would be approximately 26,527 feet (5.02 miles), with a temporary, 15-foot-wide construction

Table 4-1
Past, Present, and Reasonably Foreseeable Projects, Plans, or Actions that Comprise the Cumulative Impact Scenario

	ROW and a permanent 10-foot-wide ROW. *South Central Johnson Canyon to Cannonville, Buried Fiber Optic Line.* The BLM is proposing to issue a ROW grant for the installation of a buried fiber optic communications line from the Johnson Canyon area east of Kanab, Utah, to Cannonville, Utah. The project would extend to the north from existing infrastructure along Johnson Canyon Road, then would follow the Skutumpah Road corridor until links up with existing infrastructure south of Cannonville. The total length of the project would be 205,843 feet (39 miles). Of that length, 168,193 feet (32 miles) would be on public lands within the BLM KFO and GSENM. The permanent width of the ROW would be 10 feet, for a total of 38.612 acres, more or less. The authorization would also include temporary additional width of 5 feet during the construction phase of the project only.
Lands and realty *(cont.)*	*Lake Powell Pipeline.* The Utah State Board of Water Resources, Department of Natural Resources, is proposing to build 120 miles of 66-inch diameter pipeline from the Lake Powell Glen Canyon dam site in Arizona to Sand Hollow Reservoir near St. George, Utah. The project has been submitted to the Federal Energy Regulatory Commission for licensing and an EIS will be prepared. It is anticipated that much of the pipeline would be within the legislated utility corridor in Kane County that parallels Highway 89. One alternative proposes that the pipeline would dip south back into Arizona and transverse the Kaibab Band of the Paiute Tribe Reservation, as well as sensitive BLM-managed lands in the ASFO. All action alternatives for this project propose that the pipeline would traverse NPS-managed lands.
	Under the project, 100,000 acre-feet of water would be removed yearly and transported to supply the Kane County (10,000 acre-feet) and Washington County (90,000 acre-feet). The project would also include pumping stations along the pipeline, hydro-electric generating plants to recapture some of the power used from pumping the water uphill, and ancillary facilities including impoundment reservoirs, tunneling, electrical facilities and access roads.
	The Bureau of Reclamation administers the Colorado River Compact and allocations of associated water. The pipeline would begin on lands managed by Glen Canyon, and then travel mostly through BLM Utah and Arizona managed lands, including GSENM and Kanab, St. George, and the Arizona Strip Field Offices. Three proposed hydroelectric power facilities would require Federal Energy Regulatory Commission involvement and licensing. The Federal Energy Regulatory Commission has approved a preliminary permit for the state, which plans to submit a preliminary application document in the near future for licensing.
Water	Rising and falling water levels due to natural fluctuations and dam operations expose more or less of the Lake Powell shoreline (Bureau of Reclamation 1996; Bureau of Reclamation 2007).
	Lake Powell Pipeline. See Lake Powell pipeline description under *Lands and Realty.*
Spread of	As human-caused ground disturbance increases, the likelihood also increases that

Table 4-1
Past, Present, and Reasonably Foreseeable Projects, Plans, or Actions that Comprise the Cumulative Impact Scenario

noxious and invasive weeds	noxious weeds{ XE "Noxious Weed" } and invasive plants{ XE "Invasive Species" } would move into this disturbance. Another source of potential noxious weed and invasive plants is routine operations, such as road maintenance, firefighting, and even weed control operations (Edvarchuk and Ransom 2012, p. 41). Livestock also contribute to surface disturbances and the spread of weeds. Focused efforts have limited the spread and reduced the size of invasive plant populations in some areas. Examples are spot treatment of noxious weeds, pre-emergent herbicide application prior to seeding{ XE "Seeding" } (targeting cheatgrass), mowing or Dixie harrowing and seeding, prescribed fire use, and follow-up seeding with native species post-treatment. GSENM manages weed infestations through the Programmatic Noxious Weed and Invasive Plant Management Plan (BLM 2015b). The 2007 ROD for Vegetation Treatments Using Herbicides on BLM Lands in 17 Western States Programmatic EIS (BLM 2007c), along with the associated 2007 Programmatic EIS (BLM 2007a) and 2007 Programmatic Environmental Report (BLM 2007b) guide noxious weed management in the western states.
Spread of noxious and invasive weeds *(cont.)*	In Glen Canyon, invasive plant{ XE "Invasive Species" } species spread is managed through removal efforts. In addition, in areas that have been disturbed (which increases the likelihood of the establishment or spread of invasive plants), the area is reseeded with genetically similar native species or, where genetically similar natives are not available, with sterile hybrids. These actions can discourage invasive nonnative plant establishment and jump-start restoration of desirable native plant communities. Exotic species{ XE "Exotic Species" } will not be allowed to displace native species, if displacement can be prevented (NPS 2006, Section 4.4.4).
Fire	Fires within the region are both naturally occurring and used as a management tool. Naturally occurring fires have been widely distributed in terms of frequency and severity. Pinyon-juniper encroachment and underbrush in encroached areas have increased fuels on the landscape and, if ignited, could increase the frequency or severity of wildfires. Increasing recurrence and severity of drought conditions have been predicted for this area as a result of climate change. This could, in turn, increase the occurrence and severity of wildfires on agency land.
Drought	For much of the last decade, most of the western United States has experienced drought. Inflows to Lake Powell (indicative of the Upper Colorado Basin) have been below average since 2000. Utah regularly goes through periods of drought that may be statewide, region-wide, or local. Many resources and activities are impacted by drought, including, but not limited to, agriculture, drinking water supplies, and the likelihood of wildfires.
Climate change{ XE "Climate Change" }	Increased concern over greenhouse gas emissions and global warming issues may lead to future federal and state regulations limiting the emission of associated pollutants.

References for Table 4-1

BLM (United States Department of the Interior, Bureau of Land Management). 1980. Kanab/Escalante Grazing Management Final Environmental Impact Statement. Cedar City District, Utah.

______. 2000. Grand Staircase-Escalante National Monument Management Plan{ XE "Monument Management Plan, Grand Staircase-Escalante National Monument (MMP 2000)" } and Record of Decision. BLM, Grand Staircase-Escalante National Monument, Cedar City, Utah. February 2000.

______. 2007a. Final Vegetation Treatments Using Herbicides on Bureau of Land Management Lands in 17 Western States Programmatic Environmental Impact Statement. BLM, Nevada State Office, Reno, Nevada. June 2007.

______. 2007b. Vegetation Treatments on Bureau of Land Management Lands in 17 Western States Final Programmatic Environmental Report. BLM, Nevada State Office, Reno, Nevada. June 2007.

______. 2007c. Bureau of Land Management Vegetation Treatments Using Herbicides Final Programmatic EIS Record of Decision. BLM, Washington Office, Washington, DC. September 2007.

______. 2008a. Kanab Field Office Record of Decision and Approved Resource Management Plan. BLM, Kanab Field Office, Kanab, Utah. October 2008.

______. 2008b. Arizona Strip Field Office Record of Decision and Resource Management Plan. BLM, Arizona Strip Field Office, St. George, Utah. February 2008.

______. 2011a. Grand Staircase-Escalante National Monument Programmatic Integrated Weed Control Program. DOI-BLM_UT_0300-2011-0009-EA-Programmatic Integrated Weed Control Program. Kanab, Utah.

______. 2012. Grand Staircase-Escalante National Monument Programmatic Environmental Assessment for Organized Group Use along Hole-in-the-Rock Road. GSENM DOI-BLM-UT-0300-2010-0008-EA. Kanab, Utah.

______. 2014. Special Recreation Permit Program Business Plan: Grand Staircase – Escalante National Monument. WBS# LVRD UT 340000.

______. 2015a. ROD and Approved RMP Amendments of the Great Basin Region, Including Sub-Regions of Idaho and Southwestern Montana, Nevada and Northeastern California, Oregon, and Utah. BLM, Washington Office, Washington, DC.

______. 2015b. Environmental Assessment for Programmatic Noxious Weed and Invasive Plant Management, Grand Staircase-Escalante National Monument. BLM, GSENM, Kanab, Utah. August 29, 2015. Internet website: https://eplanning.blm.gov/epl-front-office/eplanning/planAndProjectSite.do?methodName=dispatchToPatternPage&currentPageId=61773.

______. 2016. Environmental Assessment for Calf Creek Recreation Area Site Improvements. GSENM, Kanab, Utah. December 2016. Internet website: https://eplanning.blm.gov/epl-front-office/projects/nepa/70850/94367/113873/Calf_Creek_Recreation_Area_ Improvements_EA.pdf.

Bureau of Reclamation. 1996. Record of Decision for Operation of Glen Canyon Dam/Final Environmental Impact Statement.

______. 2007. Record of Decision for Colorado River Interim Guidelines for Lower Basin Shortages and the Coordinated Operations for Lake Powell and Lake Mead/Final Environmental Impact Statement.

Edvarchuk, K., and C. Ransom. 2012. An Inventory of Noxious and Invasive Plants in Grand Staircase-Escalante National Monument - 2012 Final Report. Prepared for the Bureau of Land Management by Utah State University; Plants, Soils, and Climate; Weed Science Research Project Report No. CR1202A.

NPS (United States Department of the Interior, National Park Service). 1979. Glen Canyon National Recreation Area Proposed General Management Plan{ XE "General Management Plan, Glen Canyon (GMP 1979)" }, Wilderness Recommendation, and Road Study Alternatives Final Environmental Impact Statement.

______. 1999. Glen Canyon National Recreation Area Grazing Management Plan{ XE "Grazing Management Plan, Glen Canyon (GzMP 1999)" } and Finding of No Significant Impact. NPS, Glen Canyon National Recreation Area, Page, Arizona. August 1999.

______. 2006. Management Policies. United States Department of the Interior, National Park Service. ISBN 0-16-076874-8.

______. 2016. National Park Service Visitor Use Statistics – Glen Canyon NRA. Internet website: https://irma.nps.gov/Stats/SSRSReports/Park%20Specific%20Reports/Annual%20Park%20Recreation%20Visitation%20(1904%20-%20Last%20Calendar%20Year)?Park=GLCA.

______. 2017. Glen Canyon National Recreation Area Off-Road Vehicle Management Plan/Final Environmental Impact Statement. January 2017.

4.3 Livestock Grazing

This section discusses impacts on livestock grazing from proposed management actions. Existing conditions are described in **Section 3.1**, Livestock Grazing.

4.3.1 Methods of Analysis

In addition to the assumptions in **Section 4.1.1**, the analysis assumes the following:

- All new and existing leases and permits would be subject to terms and conditions determined by the BLM Authorized Officer to achieve the management and resource condition objectives for BLM-managed lands and to meet BLM Utah Rangeland Health{ XE "Rangeland Health" } Standards (BLM 1997). Rangeland health

standards are assessed according to BLM Handbook H-4180-1, Rangeland Health Standards (BLM 2001). Additional criteria beyond BLM Utah Rangeland Health Standards may be required on NPS-managed lands, as specified in the 1999 GzMP{ XE "Grazing Management Plan, Glen Canyon (GzMP 1999)" } and other NPS policies.

- Structural range improvements{ XE "Range Improvement" }, such as fences, pipelines, water wells, troughs, and reservoirs, could result in a localized loss of vegetation cover throughout the life of the improvements. Along water pipelines, vegetation would be reestablished through reclamation practices in the short term and to the extent possible. Areas with fences, water wells, troughs, and reservoirs could retain vegetation areas during their useful life and would be revegetated when abandoned.
- The construction of new range improvements{ XE "Range Improvement" } and maintenance of existing range improvements would continue in the decision area as needed. New range improvements could be subject to limitations, as defined in the MMP{ XE "Monument Management Plan, Grand Staircase-Escalante National Monument (MMP 2000)" }. Range improvements lead to better livestock distribution and management options, which would maintain or improve rangeland health{ XE "Rangeland Health" }.
- For the BLM, as provided for in 43 CFR, Subpart 4110.3-1, additional forage may be apportioned to qualified applicants for livestock grazing use. This would be consistent with multiple-use management objectives, which are described in the MMP{ XE "Monument Management Plan, Grand Staircase-Escalante National Monument (MMP 2000)" } and the alternatives in this MMP-A/EIS.
- The BLM developed a forage analysis model to predict the available forage within the decision area under Alternatives A, C, D, and E. The model employs ecological site description{ XE "Ecological Site" }s, current vegetation conditions, slope data, and other adjustments. It is based on the best available data and, where data are incomplete, on professional judgment. As with any model, it contains assumptions and cannot account for all factors affecting available forage; its output relies on the quality of the input data. As a result, the model is not used to set AUM levels under the alternatives; rather, it is used only for comparing available forage under the alternatives. Forage{ XE "Forage" } model results for Alternative A is the baseline against which the action alternatives are compared. For more information on the model, including method and detailed results, see **Appendix D,** Forage Analysis Model.

4.3.2 Factors for Analysis

Factors for analysis of impacts on livestock grazing are the following:

- Changes in acres available for livestock grazing
- Changes in AUMs allocated for livestock
- Changes in density of AUMs for livestock (acres available per AUM)

- Allowance for or restrictions on the construction or maintenance of new structural and nonstructural range improvements{ XE "Range Improvement" }
- Changes to the timing, duration, or frequency of permitted use, including temporary closures

4.3.3 Nature and Type of Impacts

Impacts on livestock grazing are generally the result of activities that affect forage levels, areas available for grazing, class of livestock, season of use and timing, and the ability to construct range improvements{ XE "Range Improvement" }, as well as disturbances or harassment of livestock in grazing allotments. Key types of impacts are detailed below. Management actions could result in economic impacts on individuals and the community at large, both directly and indirectly, are detailed in **Section 4.21**, Socioeconomics.

Implementing livestock grazing management may impact the permittee. This would come about by requiring more intensive livestock management, season of use changes, class of livestock changes, modified grazing systems, range improvements{ XE "Range Improvement" }, changes in AUMs, or other actions needed to meet habitat objectives or to protect other resources. AUMs, or other actions needed to meet habitat objectives or to protect other resources.

By making an area unavailable for livestock grazing, the beneficial use associated with a water right for livestock watering in that area will cease. Without the beneficial use, the water right may become at risk for an abandonment or forfeiture proceeding. Utah state law provides that when a federal land management agency, such as the BLM or NPS, "reduces livestock grazing AUMs on federal grazing allotments, and the reduction results in the partial forfeiture of an appropriated water right, the amount of water in question for nonuse as a livestock water right shall be held in trust by the state engineer until such water may be appropriated for livestock watering…." (Utah Code Sec. 73-3-1 [Senate Bill 274]). However, the BLM also owns most water rights that are solely for livestock watering in GSENM. Additionally, whether or not an allotment is available for livestock grazing, a permittee who solely holds a water right may pursue a change application to an existing water right through the Utah State Engineer.

Adjustments to grazing management can alter available forage in the short term. Reductions in grazing use could be direct, by making areas unavailable for grazing, or indirect, by limiting the season of use or the ability to use available forage; that is, limiting distribution by restricting range improvement{ XE "Range Improvement" } construction. In addition, not maintaining improvements can reduce forage availability. For example, if seedings{ XE "Seeding" } are not maintained, optimal forage is not available for the permittees to use. Similarly, if water developments are not maintained, livestock are unlikely to access available forage in that area. The level of impacts would depend on the percentage of individual allotments impacted, the forage condition on impacted allotments, and the degree that permittees depend on federal lands for forage. In the long term, adjustments to grazing management could promote healthy forage and open up forage in areas that may not usually be available.

Temporarily removing livestock during times of drought or post-vegetation disturbance could limit where permittees put their livestock; however, this may not impact the level of forage available overall, due to the temporary nature of such restrictions.

Construction of range improvements{ XE "Range Improvement" }; however, it could impact the livestock permittee economically in the short term. Constructing off-site water sources and fencing riparian and spring{ XE "Spring" } sources could keep livestock away from sensitive riparian areas{ XE "Riparian Area" } and provide a cleaner, more, encourage plant recovery, and provide a cleaner, more reliable water source for livestock. In other cases, rangeland management changes could be designed to protect other resources or resource uses, such as cultural resources or threatened and endangered species. In these instances, management changes could result in additional limitations on livestock grazing and no changes or enhancement to rangeland conditions.

As stated above, constructing range improvements{ XE "Range Improvement" } could improve livestock distribution and allow livestock to use more of the rangeland, which would consequently enhance rangeland conditions. Conversely, restricting range improvements could affect livestock operations by not supporting effective distribution and thus increasing the cost or time for management. In some cases, restrictions may limit the ability to fully use permitted AUMs; for example, restrictions impacting water development could limit use if capacity were limited by water distribution.

In general, vegetation management imposes short- and long-term limitations on grazing. Examples are requiring rest periods and adjusting timing of grazing in order to meet resource objectives. As a result, site-specific direct and indirect impacts may occur, and costs and time required for livestock management would increase, with the level of impact depending on the extent and nature of treatments.

Where the primary objective of nonstructural range improvements{ XE "Range Improvement" } is to promote livestock forage availability or support healthy rangeland ecosystems, requirements would be in line with BLM Utah Rangeland Health{ XE "Rangeland Health" } Standards (BLM 1997); both long- and short-term impacts on grazing would be minimized. On NPS-managed lands, additional criteria beyond BLM Utah Rangeland Health Standards may be required, as specified in the 1999 GzMP{ XE "Grazing Management Plan, Glen Canyon (GzMP 1999)" } and other NPS policies.

Nonstructural range improvements{ XE "Range Improvement" } designed to reduce the intrusion of nonnative annual grasses, such as cheatgrass, and the encroachment of shrubby vegetation could have short-term impacts on livestock grazing, such as removing forage and requiring rest periods from grazing. However, these nonstructural range improvements would generally enhance rangeland conditions in the long term, including maintaining or improving the available forage, which is the amount of vegetation available for wildlife and livestock use (DiTomaso 2000; Vollmer and Vollmer 2008; Gottfried and Severson 1994).

Should all or a portion of an allotment be made unavailable for livestock grazing for vegetation or riparian management, there would be impacts on permittees, including direct loss of forage and ability to distribute livestock. The level of impacts would depend on the number of allotments or portions of allotments made unavailable, the forage condition on the remaining allotments or portions of allotments, if applicable, and the degree of permittees' dependence on federal lands for forage. If sufficient forage were not available on the remainder of the

allotments, permittees would need to reduce federal grazing use and reduce herd size or substitute alternative forage, which would typically reduce profits (Torell et al. 2014).

As noted by Torell et al. (2002), if a ranch is seasonally dependent on federal forage, reducing AUMs can create forage imbalances and produce a greater reduction in grazing capacity than just the loss of federal AUMs. The impact of eliminating or reducing grazing during selected seasons would depend on ranch resources and the substitute forage alternatives that are economically and physically available (Torell et al. 2014). Impacts would occur at the time of permit or lease renewal. A detailed discussion of economic impacts from reducing acres available for grazing and livestock forage AUMS is included in the socioeconomic analysis in **Section 4.21**, Socioeconomics.

As noted in the livestock grazing assumptions, above, indirect impacts from making areas unavailable for grazing would include the need to construct fencing or otherwise manage livestock to ensure that they are excluded from areas made unavailable. The need for increased management to implement these actions would increase time and costs for permittees. For example, there can be significant economic constraints to installing exclusion fencing (Agouridis et al. 2005). The exact cost of fencing would be variable, as the BLM would have limited jurisdiction on fence material and methods on adjunct private lands. The need for additional fencing and the responsibility for the associated costs would be determined on a case-by-case basis in the context of cooperative agreements. Implementing particular livestock grazing management actions could affect livestock grazing by increasing permittees' costs or changing management actions. Short-term and long-term costs to permittees could increase, or AUMs could decrease for some permittees due to the following:

- Implementation of grazing strategy
- Change in season of use or livestock class
- Modification to grazing systems
- Construction of range improvements**{** XE "Range Improvement" **}** or other approaches to meet rangeland condition objectives or to protect other resources

Management practices to protect rangeland health**{** XE "Rangeland Health" **}** indirectly impact grazing. Protecting water quality and watershed health to meet BLM Utah Rangeland Health Standards in riparian and wetland**{** XE "Wetland" **}** areas could require changes in livestock management. Examples of this are deferring or shortening grazing periods, change in season of use, adding range improvements**{** XE "Range Improvement" **}**, excluding grazing from riparian areas**{** XE "Riparian Area" **}**, establishing riparian pastures, and increasing livestock herding. These limitations could increase costs to permittees if changes were to indirectly reduce forage availability or increase management requirements. On NPS-managed lands, additional criteria beyond BLM Utah Rangeland Health Standards may be required, as specified in the 1999 GzMP**{** XE "Grazing Management Plan, Glen Canyon (GzMP 1999)" **}** and other NPS policies.

Managing for healthy watersheds provides for necessary water sources and improved forage conditions for livestock grazing in the long term. Protecting water quality and watershed health could require changes in livestock management, such as deferring or shortening grazing periods

and adding range improvements{ XE "Range Improvement" }. It could also improve forage for livestock. Alternatively, treatments to improve land health, such as treatments on encroached pinyon-juniper, could also improve forage for livestock.

Improper livestock grazing can have adverse impacts on riparian ecosystems (Armour et al. 1991); therefore, managing riparian habitat to meet BLM Utah Rangeland Health{ XE "Rangeland Health" } Standards can directly impact livestock grazing by excluding livestock at specific sites, implementing trailing only{ XE "Trailing Only" }, increasing herding, adding range improvements{ XE "Range Improvement" } (such as cross fences and water gaps), and adjusting season of use and livestock numbers. Should all or a portion of an allotment be made unavailable for livestock grazing for vegetation or riparian management, there would be impacts on permittees, including direct loss of forage and ability to distribute livestock. On NPS-managed lands, additional criteria beyond BLM Utah Rangeland Health Standards may be required, as specified in the 1999 GzMP{ XE "Grazing Management Plan, Glen Canyon (GzMP 1999)" } and other NPS policies.

The level of impacts would depend on the number of individual allotments or portions of allotments made unavailable, the forage condition on the remaining allotments or portions of allotments, if applicable, and the degree of dependence of permittees on federal lands for forage. If sufficient forage were not available on the remainder of the allotments, permittees would need to reduce federal grazing use and herd size or substitute alternative forage, which would typically reduce profits (Torell et al. 2014).

Allowing riparian habitat to maintain proper functioning condition would impact grazing livestock indirectly by providing cleaner and more reliable water sources and forage availability that is more dependable.

Management of rangeland vegetation generally enhances vegetation conditions and indirectly affects livestock grazing by increasing vegetation productivity and improving forage conditions. Vegetation treatments{ XE "Vegetation Treatment" } designed to reduce the incursion of nonnative annual grasses, such as cheatgrass, the encroachment of shrubby vegetation, and the buildup of biomass could have short-term impacts on livestock grazing. Short term impacts include removal of forage and required rest periods from grazing. However, these treatments generally enhance rangeland conditions by maintaining the forage base (the amount of vegetation available for wildlife and livestock use) in the long term. (See *Vegetation Restoration Methods* in MMP{ XE "Monument Management Plan, Grand Staircase-Escalante National Monument (MMP 2000)" }, [BLM 2000 p. 26].)

4.3.4 Direct and Indirect Impacts

Impacts Common to Alternatives A, C, D, and E

As discussed in **Section 4.1.2**, General Method for Analyzing Impacts, the density of acres available per AUM for both active permitted use and projected average actual use are similar among Alternatives A, C, D, and E. Furthermore, the density of acres available per AUM does not reflect actual patterns of livestock distribution. Consequently, density is not further analyzed in this section. See **Section 4.1.2** for more detail.

There are six livestock grazing allotments Under Alternatives A, C, D, and E, allotments would be managed toward meeting BLM Utah Rangeland Health{ XE "Rangeland Health" } Standards. On NPS-managed lands, additional criteria beyond BLM Utah Rangeland Health Standards may be required, as specified in the 1999 GzMP{ XE "Grazing Management Plan, Glen Canyon (GzMP 1999)" } and other NPS policies. This could necessitate changes to grazing management, at increased time and costs for permittees. Where allotments are found to not meet land health standards as a result of livestock grazing, site-specific changes to grazing management occur, with increased time and costs for permittees and lessees, as discussed under *Nature and Type of Impacts.*

Managing structural range improvements{ XE "Range Improvement" } would impact livestock grazing, as described under *Nature and Type of Impacts.*

Meeting state and federal water quality standards could result in some site-specific restrictions on livestock grazing operations in riparian areas{ XE "Riparian Area" }. However, management would generally correspond with requirements for land health standards, so impacts would be minimized. They are as identified under *Nature and Type of Impacts*.

Monitoring reference sites would determine which tools are successful in maintaining rangeland health{ XE "Rangeland Health" } for permittees and BLM specialists for the efficient management of livestock grazing.

NPS management policies do not support the use of nonnative species for nonstructural range improvements{ XE "Range Improvement" } in Glen Canyon. Therefore, none of the alternatives would implement such measures in Glen Canyon, and there would be no possibility of increased forage from nonnative species.

Alternative A

Under Alternative A, continuing to manage 2,089,000 acres as available to livestock grazing and 153,000 acres as unavailable to grazing would allow permitted grazing to continue at current levels (76,957 active AUMs of a maximum permitted 106,202 AUMs). Average actual use is 41,343 AUMs. There would be no change in the number of grazing permits{ XE "Permit, Grazing" }, because the same allotments would continue to be available or unavailable for livestock grazing. The socioeconomic impacts from grazing on public lands are discussed in **Section 4.21**, Socioeconomics.

Impacts from continued management of structural and nonstructural range improvements{ XE "Range Improvement" } would be the same as those identified under *Nature and Type of Impacts.* However, allowing for native and nonnative species to be used for nonstructural range improvements gives grazing permit{ XE "Permit, Grazing" }tees options and flexibility.

Continuing to allocate pastures and allotments as forage reserves provides enhanced management options for permittees and leases. This is because permittees have options to graze livestock if their allotments are temporarily unavailable. Allowing newly acquired land to be managed similarly to surrounding uses could provide new opportunities or available forage for livestock permittees.

Voluntary relinquishment of grazing permits{ XE "Permit, Grazing" } would continue to be processed in accordance with IM 2013-184. This allows for the relinquished permit to be issued to another applicant or for the allotment to be combined with another; this would provide opportunities for other permittees to acquire additional permits. The allotment could also be used as a reserve common allotment{ XE "Reserve Common Allotment" }, which would give nearby permittees opportunities to use public lands for grazing should their allotments be temporarily unavailable for grazing. On the other hand, the IM also allows for the BLM to allocate the forage for uses other than grazing, which would diminish opportunities for permittees.

Continuing to exclude sheep grazing within 9 miles of bighorn sheep habitat limits permittees' flexibility to graze livestock best suited for varying terrains and elevations. If an allotment is converted from domestic sheep use to cattle use, the permittees would lose flexibility and would need to either change the kind of livestock from sheep to cattle in their operation or seek other grazing lands. This could result in financial hardship for permittees, to the extent that they could be forced out of the sheep industry. (Note that there are currently no permittees that graze sheep, so there are no reasonably foreseeable impacts.)

Short-term changes to livestock management could also occur from drought management, with impacts, at a site-specific level, as discussed under *Nature and Type of Impacts*. Protecting range resources would have potential for short-term limitations on livestock grazing management on a site-specific basis, as discussed under *Nature and Type of Impacts*; however, few specific measures are in place.

Continuing to use only native plants to increase forage limits a permittee's flexibility to provide forage for livestock, especially in cases where native vegetation does not germinate as well as nonnative plants.

Alternative B

Alternative B would be the most restrictive on grazing management; livestock grazing would be discontinued, following a 2-year notice to cancel existing permits and leases (136 in total; a 100 percent reduction). Discontinuing livestock grazing would result in economic impacts on permittees (see **Section 4.21**, Socioeconomics). Permittees would have to reduce the size of their operations or locate replacement forage elsewhere. This could result in higher costs or even lost opportunities, impacting individual permit holders and the local community. Making the decision area unavailable for livestock grazing would also disrupt the viability of current seasonal rotations or other management strategies that use combinations of federal, state, and private lands. This could reduce the value of private lands used for grazing. If ranches are not maintained or profitable, they could be sold for development (Wilkins et al. 2003).

The water rights for livestock watering held solely by permittees would be impacted, as described under *Nature and Type of Impacts*, across the entire decision area as a result of the discontinuation of livestock grazing.

Existing structures under Alternative B could be required to be modified or removed. Removal would depend on a structure's utility, historic significance, or other purposes. However, permittees and lessees who have investments on federal lands could be compensated.

Compensation for those with authorized range improvements{ XE "Range Improvement" } would be provided, as appropriate, based on requirements specified in 43 CFR, Subpart 4120.3-6(c). BLM investments in range infrastructure could also be impacted under this alternative, because structures no longer would be maintained and would go into disrepair. Furthermore, fencing may be required to prevent livestock from trespassing onto lands where grazing is excluded.

Removing range improvements{ XE "Range Improvement" } and water developments would also further restrict management options. Permittees and lessees who rotate pastures between private and federal lands may need to construct additional water developments and realign fences to keep livestock on private pastures, thereby increasing time and costs. Fencing density could increase in areas where federal, state, and private lands are interspersed and are grazed in common.

By discontinuing grazing within the decision area, former federal grazing permit{ XE "Permit, Grazing" }tees may seek areas of nonfederal surface estate in order to continue grazing livestock. This would increase the potential for conflicts between grazing and other resources uses on those nonfederal lands that experience increased livestock grazing.

Alternative C

Under Alternative C, the BLM would reduce the acres available for grazing (a 23 percent reduction, compared with Alternative A). Based on the forage model described in **Appendix D**, estimated forage production would decrease by 33 percent, compared with Alternative A. A maximum of 92,389 AUMs would be permitted, 63,144 of which would be active (18 percent decrease in active AUMs, compared with Alternative A). The estimated average actual use would decrease by 7,975 AUMs. Reducing permitted AUMs could result in impacts on the ability of individual permittees and lessees to maintain operations, with a potential for economic impacts at the individual or community level. Fifty-two permits would be cancelled, a 38 percent reduction. The socioeconomic impacts from grazing on public lands are discussed in **Section 4.21**, Socioeconomics.

The water rights for livestock watering held solely by permittees would be impacted, as described under *Nature and Type of Impacts*, within those allotments made unavailable for livestock grazing. Not providing reserve common allotments{ XE "Reserve Common Allotment" } under Alternative C could remove an opportunity for permittees to continue grazing their livestock on BLM-managed lands. This would be the case when their own allotment is temporarily unavailable due to an emergency situation, impacting the permittees financially.

Impacts on livestock grazing as a result of newly acquired lands would be the same as those under Alternative A. Impacts from voluntary permit relinquishments would have similar impacts as those under Alternative A. However, the preference under Alternative C would be to allocate the forage for uses other than livestock, which would eliminate opportunities for permittees to acquire relinquished permits.

Restricting the type and kind of livestock to cattle and horses would impact permittees in ways similar to Alternative A, but over the entire decision area. However, because there are currently no sheep permitted in the decision area, there would not be any reasonably

foreseeable impacts. Alternative C would also place the greatest restrictions and requirements on lands available for grazing, thereby increasing costs and limiting a permittee's flexibility and available management tools. These types of restrictions would be for, but are not limited to, salt block placement, grazing in the winter, and rest time between grazing years.

Under Alternative C, resting seeded areas from grazing for at least two growing seasons or longer (i.e., until the majority of native plant species have seeded) restricts grazing forage and reduces flexibility of grazing permit{ XE "Permit, Grazing" }tees. Prohibiting the use of nonnative plants to increase forage for livestock would impact livestock grazing operations the same as under Alternative A.

Allocating reserve common allotments{ XE "Reserve Common Allotment" } as available for livestock grazing would provide additional opportunities for permittees to acquire grazing permits{ XE "Permit, Grazing" }. However, because there would be no reserve common allotments, there would be reduced flexibility during times when reserve common allotments would be needed if permittees' allotments are put into temporary nonuse in emergency situations. This would impact the permittees financially and would take away opportunities to help them continue to graze their own livestock.

Alternative C also calls for the use of large ungrazed reference areas that have not been grazed or accessible to livestock for 10 years. Available allotments should be managed to 80 percent of relevant ungrazed reference areas for the indicators described in the alternatives matrix under that alternative. Given the existing science (e.g., Bowker et al. 2013), this alternative is expected to result in a suspension{ XE "Suspension" } of some permitted AUMs after the reference areas are established. In order to establish and maintain the reference areas, the installation and maintenance of fencing may be required for the exclusion of livestock from these areas.

Alternative D

Under Alternative D, the BLM would increase the acres available for grazing (2 percent increase, compared with Alternative A). A maximum of 107,955 active AUMs would be permitted (a 40 percent increase in active AUMs from Alternative A, due to restoring suspended{ XE "Suspension" } AUMs to active use during permit renewal). Estimated average actual use would increase by 1,542 AUMs. Areas under Alternative A that were restricted to trailing would be available for livestock grazing under Alternative D. Based on the forage model described in **Appendix D**, estimated forage production would increase by 24 percent, compared with Alternative A. This increase is in part because more areas would be available for livestock grazing. In addition, this alternative allows for the implementation of additional nonstructural range improvements{ XE "Range Improvement" } in GSENM. The resulting increase in forage capacity would help reactivate suspended AUMs during permit renewal. No permits would be cancelled, and new permits may be issued for the allotments, which would become available under this alternative. The socioeconomic impacts from grazing on public lands are discussed in **Section 4.21**, Socioeconomics.

Allocating reserve common allotments{ XE "Reserve Common Allotment" } as available for grazing would provide additional opportunities for permittees to acquire grazing permits{ XE "Permit, Grazing" }. However, because there would be no reserve common allotments, there would be reduced flexibility during times when reserve common allotments would be needed if

permittees' allotments are put into temporary nonuse in emergency situations. This takes away opportunities to help permittees continue to graze their own livestock, financially impacting permittees.

Alternative D would provide for the greatest opportunity for livestock permittees and available forage by making newly acquired lands available to livestock grazing. Impacts from permittees voluntary relinquishing permits would be similar to those described for Alternative A. However, the preference under Alternative D would be for relinquished permits to be reissued to another permittee. This would increase opportunities for permittees to acquire new or additional permits in the decision area.

Impacts from restricting the type and kind of livestock to cattle and horses would be the same as previously described under Alternative C.

The impacts from modifying livestock grazing practices following seed restoration would be the same as those under Alternative A. Alternative D would provide the greatest flexibility to grazing permit**{** XE "Permit, Grazing" **}**tees. It would also provide the greatest potential for forage production, by allowing the use of native or nonnative seeds in nonstructural range improvements**{** XE "Range Improvement" **}**.

Alternative E

Under Alternative E, the BLM would slightly decrease the acres available for grazing (a 1 percent reduction, compared with Alternative A). Based on the forage model described in **Appendix D**, estimated forage production would increase by 21 percent, compared with Alternative A. A maximum of 105,540 AUMs would be permitted, 76,295 of which would be active (a 1 percent decrease in active AUMs, compared with Alternative A). Estimated average actual use would decrease by 1,243 AUMs, compared with Alternative A. One permit would be cancelled under this alternative; however, a new permit or permits may be issued for the one allotment that would become available under the alternative. The socioeconomic impacts from grazing on public lands are discussed in **Section 4.21**, Socioeconomics.

Continuing to allocate existing and making new reserve common allotments**{** XE "Reserve Common Allotment" **}** provides greater management options for permittees and lessees than under Alternative A. Impacts on livestock grazing as a result of newly acquired lands would be the same as under Alternative A. Impacts from voluntary relinquishments of permits would have the same impacts as under Alternative A.

Impacts from restricting the type and kind of livestock to cattle and horses would be the same as previously described under Alternative C.

The impacts from modifying livestock grazing practices following seed restoration would be the same as identified under Alternative A. Alternative E would provide greater flexibility to grazing permit**{** XE "Permit, Grazing" **}**tees than under Alternative A by allowing for the use of native or nonnative seeds (although prioritized with native first) in nonstructural range improvements**{** XE "Range Improvement" **}**. In Glen Canyon, NPS management policies do not support the use of nonnative species for nonstructural range improvements. Therefore, none of the alternatives

would implement such measures in Glen Canyon and there would be no possibility of increased forage from nonnative species.

4.3.5 Cumulative Impacts

The cumulative impacts analysis area for livestock grazing is the planning area.

Cumulative projects, as described in **Table 4-1**, that increase human-caused disturbances in grazing areas can directly impact grazing by displacing livestock. Cumulative projects that increase human-caused disturbances in grazing areas could also indirectly impact livestock grazing by increasing weeds and invasive species**{** XE "Invasive Species" **}** previously stated, weed invasion can reduce preferred livestock and wildlife forage and increase the likelihood of weed dispersion by roaming cattle. Alternatively, other human-caused disturbances, such as vegetation treatments**{** XE "Vegetation Treatment" **}**, may displace livestock in the short term, but increase the capacity for livestock grazing over the long term.

Past actions that have affected livestock grazing are human-caused surface disturbances (recreation, prescribed burning, mechanical vegetation treatments**{** XE "Vegetation Treatment" **}**, and historical grazing practices) and wildfires that have contributed to current ecological conditions. Present actions affecting livestock grazing are mainly those that reduce available grazing acreage and those that restrict management actions or the level of forage production in those areas. Key examples are wildfires, motorized vehicle use, recreation, habitat restoration, and fuel reduction. Future actions affecting livestock grazing would be similar to present actions. Demands for recreation and the potential for conflicts with livestock grazing are likely to increase over the life of the plan. Vegetation projects to reduce fire risk or improve habitat conditions, such as hazardous fuels reduction and conifer removal, may result in short-term restrictions on grazing management, but they could improve forage conditions in the long term.

Natural processes may also impact the type and quality of vegetation and forage availability over time. Increasing recurrence and severity of drought conditions have been predicted for this area as a result of climate change. This could impact both forage availability and water availability, impacting management options for permittees and lessees. In addition, climate change has the potential to increase the occurrence and severity of wildfires in the planning area, which would also impact short-term forage availability.

Management of resources and uses outside of grazing in the current plans cumulatively impact livestock grazing. For example, management to enhance fish and wildlife habitat would generally affect livestock grazing through potential management changes to control livestock distribution and use of critical habitats. However, actions to improve or expand wildlife habitat could also improve forage conditions in the long term and indirectly maintain or increase forage production. (See *Fish and Wildlife Objectives and Actions* in MMP**{** XE "Monument Management Plan, Grand Staircase-Escalante National Monument (MMP 2000)" **}** [BLM 2000, p. 12].)

Wildfire would have varying impacts on livestock grazing, depending on fire location and size, intensity, severity, and timing. Initially, wildfire would likely displace livestock, and, depending on the proximity to the fire, livestock could be stressed, injured, or killed. Wildfire would remove vegetation and forage over the short term. Additional impacts on livestock operations could occur when BLM guidelines require a rest period following rehabilitation and before grazing is

reestablished. Over the long term, wildfire could improve forage production, especially when post-fire management efforts are implemented, such as reseeding. Restoring natural disturbance regimes, such as fire, and accomplishing biodiversity objectives to improve plant community resilience, would also impact livestock grazing by maintaining a balance of seral stages.

Activities associated with the management of cultural resources would affect relatively small areas (typically less than 1 acre) and would have minimal impacts on livestock grazing. In general, information provided by cultural resource inventories can limit or eliminate livestock management activities, specifically the presence or location of range improvements{ XE "Range Improvement" }, on a case-by-case basis. (See objectives and actions in the MMP{ XE "Monument Management Plan, Grand Staircase-Escalante National Monument (MMP 2000)" } for archaeological resources [p. 10] and historic resources [p. 18].)

Recreation can affect livestock grazing directly through human-caused disturbances and indirectly through rangeland degradation. Direct disturbance can include the following:

- Undesired animal dispersing or trespassing due to gates left open by recreational users
- Animal displacement, harassment, or injury from collisions or shooting
- Damage to range improvements{ XE "Range Improvement" }, particularly from the use of recreational vehicles or vandalism
- Obstructing livestock from accessing water sources and corrals

In addition, motorized vehicle use on unpaved roads can result in indirect impacts, such as increased dust on forage in high-use areas, leading to lower forage palatability. The degree of impact depends upon the amount of dust deposited, which is influenced by factors such as the amount of vehicle use on the unpaved surface, the speed at which a vehicle travels, and wind speed and direction at the time of use.

Other long-term recreation impacts include disturbance caused by increased levels of human activities. The degree of impacts would vary with the intensity of recreation; that is, large numbers of people may have a higher level of disturbance, as compared with frequent use by a small number of visitors due to habituation of cattle to such use. Other considerations are the timing of recreation activities (livestock could be more susceptible to disturbance during the spring{ XE "Spring" } when young are present) and the location of recreation in the allotment (a higher level of disturbance could occur near areas frequented by livestock, such as water sources or salt licks). Excluding livestock at major recreation sites due to conflicts between these two resource uses would lead to a long-term reduction in grazing in the decision area, depending on the specific locations impacted.

The contribution to cumulative impacts from proposed management under each alternative would parallel the impacts of the alternatives in the general impact analysis, above. In general, management actions under every alternative would result in short-term or long-term changes in availability of forage. This would be due to treatment activities, other surface-disturbing and

disruptive activities, human-caused disturbances, the presence of livestock grazing, wildlife, threatened or endangered species, and special designations.

The greatest contribution to cumulative impacts would occur under Alternative B, by making BLM-managed lands in the decision area unavailable to grazing. Making lands unavailable would impact area permittees and lessees economically and may put additional pressure on forage resources on private lands in the area. This is because permittees would be faced with locating replacement forage on lands not administered by the BLM.

Cumulative impacts from each resource or resource use would be greater on livestock grazing if the cumulative projects were to occur simultaneously.

4.3.6 References

Agouridis, C. T., S. R. Workman, R. C. Warner, and G. D. Jennings. 2005. "Livestock grazing management impacts on stream water quality: A review." *Journal of American Water Resources Association* 41(3):591-606.

Armour, C. L., D. A. Duff, and W. Elmore. 1991. "The effect of livestock grazing on riparian and stream ecosystems." *Fisheries* (16)1:7-11. January-February 1991.

BLM (United States Department of the Interior, Bureau of Land Management). 1997. Standards for Rangeland Health{ XE "Rangeland Health" } and Guidelines for Grazing Management for BLM Lands in Utah. BLM, Utah State Office.

_____. 2000. Grand Staircase-Escalante National Monument Management Plan{ XE "Monument Management Plan, Grand Staircase-Escalante National Monument (MMP 2000)" } and Record of Decision. BLM, Grand Staircase-Escalante National Monument, Cedar City, Utah. February 2000.

_____. 2001. Handbook H-4180-1, Rangeland Health{ XE "Rangeland Health" } Standards. Rel. 4-107. BLM, Washington, DC. January 19, 2001.

Bowker, M. A., M. E. Miller, R. T. Belote, and S. L. Garman. 2013. Ecological Thresholds as a Basis for Defining Management Triggers for National Park Service Vital Signs-Case Studies for Dryland Ecosystems. US Geological Survey Open-File Report 2013-1244. Reston, Virginia.

DiTomaso, J. M. 2000. "Invasive weeds in rangelands: Species, impacts, and management." *Weed Science* 48(2):255-265.

Gottfried, G. J., and K. E. Severson. 1994. "Managing pinyon-juniper woodlands." *Rangelands* 16:234-236.

Torell, A. L., J. A. Tanaka, N. Rimbey, T. Darden, L. V. Tassell, and A. Harp. 2002. Ranch-Level Impacts of Changing Grazing Policies on BLM Land to Protect the Greater Sage-Grouse{ XE "Greater Sage-Grouse" }: Evidence from Idaho, Nevada, and Oregon. (Policy Paper SG-01-02). Policy Analysis Center for Western Public Lands, Caldwell, Idaho.

Torell, A. L., N. R. Rimbey, J. A. Tanaka, D. T. Taylor, and J. D. Wulfhorst. 2014. "Ranch-Level economic impact analysis for public lands: A guide to methods, issues, and applications." *Journal of Rangeland Applications* 1(2014):1-13. ISSN: 2331-5512.

Vollmer, J. L., and J. G. Vollmer. 2008. "Controlling cheatgrass in winter range to restore habitat and endemic fire." USDA Forest Service Proceedings RMRS-P-52.

Wilkins, R. N., R. D. Brown, R. J. Conner, J. Engle, C. Gilliland, A. Hays, R. D. Slack, and D. W. Steinbach. 2003. "Fragmented lands: Changing land ownership in Texas." Texas A&M University, College Station.

4.4 VEGETATION

This section discusses impacts on upland vegetation, riparian and wetland**{** XE "Wetland" **}** vegetation, and noxious weeds**{** XE "Noxious Weed" **}** and nonnative invasive plants**{** XE "Invasive Species" **}** from proposed management actions. Existing conditions are described in **Section 3.2**, Vegetation.

4.4.1 Methods of Analysis

Impacts were determined by assessing which actions would change the upland vegetation, riparian and wetland**{** XE "Wetland" **}** vegetation, and noxious weeds**{** XE "Noxious Weed" **}** and nonnative invasive plants**{** XE "Invasive Species" **}** factors of analysis described below. Some impacts are direct, while others are indirect and affect vegetation through a change in another resource. Direct impacts on vegetation include damaging or removing vegetation, thereby reducing area, amount, or condition of native vegetation. Included among these are actions that reduce total numbers of desirable plant species and actions that reduce or cause the loss of desirable species composition, vigor, or structure of vegetation or that degrade its function for wildlife habitat.

Indirect impacts are those that occur later in time or farther removed in distance, such as decreased plant vigor or health from dust or reduced water quality. Other indirect impacts are as follows:

- Loss of habitat suitable for vegetation colonization due to surface disturbance from human-caused sources
- Introduction of weeds that compete with desirable, native vegetation
- Conditions that enhance the spread of weeds
- General loss of habitat due to surface occupancy or soil compaction

In addition to the assumptions in **Section 4.1.1**, the analysis assumes that annual climate fluctuation would continue to influence the health and productivity of plant communities.

4.4.2 Factors for Analysis

Factors for analysis of impacts on vegetation are the following:

BLM Factors

- Potential for meeting BLM Utah Rangeland Health{ XE "Rangeland Health" } Standards, as affected by:
  - Changes in acres available for livestock grazing
  - Changes in AUMs allocated for livestock
  - Changes in density of AUMs for livestock (acres available per AUM)
  - Allowance for or restrictions on the construction or maintenance of new structural and nonstructural range improvements{ XE "Range Improvement" }

NPS Factors

- Potential for meeting BLM Utah Rangeland Health{ XE "Rangeland Health" } Standards and additional NPS desired vegetation standards, as affected by:
  - Changes in acres available for livestock grazing
  - Changes in AUMs allocated for livestock
  - Changes in density of AUMs for livestock (acres available per AUM)
  - Allowance for or restrictions on the construction or maintenance of new structural and nonstructural range improvements{ XE "Range Improvement" }

4.4.3 Nature and Type of Impacts

All Vegetation Communities and Weeds

The type, abundance, and distribution of vegetation communities within the decision area would be affected under all alternatives. Impacts on vegetation associated with livestock grazing management can be broadly categorized as follows:

- Vegetation manipulation
- Surface disturbance related to structural and nonstructural range improvements{ XE "Range Improvement" }
- Resource use

These are described in more detail below.

Vegetation manipulation—Vegetation manipulation includes actions designed to alter vegetation from its current state, such as nonstructural range improvements{ XE "Range Improvement" } and forage improvement. Vegetation manipulation associated with livestock grazing management would directly alter the condition of native vegetation communities by changing the density, composition, and frequency of species in the communities. Vegetation manipulations in a given area would favor some plant species to the detriment of other species (Wagner et al. 2010). Despite the use of best management practices (BMPs), desired results on vegetation condition

may not always be achieved. This could be due to such factors as precipitation, availability of seeds, or restoration techniques.

All types of vegetation manipulation affect the spread of invasive species{ XE "Invasive Species" }, both directly and indirectly. Invasive species change vegetation condition by outcompeting native plants for space, water, nutrients (Sakai et al. 2001), and other resources and by preventing native species seedling germination and establishment. Among the different types of vegetation manipulations, weed treatments are the most likely to directly reduce invasive species. However, they can also result in unintended damage to native, desirable species (Crone et al. 2009). Other vegetation manipulations often result in an unintended increase of invasive species through associated soil disturbance, seed and soil introductions, and reduced native species competition (Merriam et al. 2006).

The condition of the riparian vegetation community, individual riparian plant species, and hydrologic functionality would be directly impacted with nonstructural range improvements{ XE "Range Improvement" } in the riparian zone, as these improvements would control or eradicate invasive species{ XE "Invasive Species" } and restore native species.

Surface disturbance related to structural and nonstructural range improvements{ XE "Range Improvement" }—Construction of range improvements, such as stock ponds and fences, would permanently remove vegetation within their footprint and could concentrate livestock to specific locations. This would increase such impacts as resource use (described below) and soil disturbance and compaction associated with livestock grazing. However, range improvements can be designed to facilitate better distribution of livestock to reduce such impacts.

Soil disturbance associated with livestock grazing could cause erosion, topsoil and biological soil crust{ XE "Biological Soil Crust" } loss, and soil compaction. This could affect vegetation's ability to regenerate and could facilitate nonnative annual grass introduction and spread. For instance, sites with high biological soil crust cover have been shown to have low annual grass cover; biological soil crust cover is among the predictors of annual grass cover (Peterson 2013). In addition, livestock grazing is thought to reduce resistance to cheatgrass by reducing bunchgrass abundance, shifting bunchgrass composition, and reducing biological soil crusts (Reisner et al. 2013).

Soil compaction from livestock grazing results in decreased vegetation cover and more exposure of the soil surface to erosion (Burton et al. 2008). Soil compaction may also affect the size and abundance of plants by reducing moisture availability and precluding adequate taproot penetration to deeper horizons (Ouren et al. 2007). Furthermore, soil disturbance could increase dust, which could cover existing vegetation and impair plant photosynthesis and respiration. Resulting impacts could include lowered plant vigor and growth rate, altered or disrupted pollination, and increased susceptibility to disease, drought, or insect attack. As a result, surface-disturbing activities could affect the density, composition, and frequency of species in an area, thus affecting native vegetation condition.

Some vegetation communities, such as salt desert shrub and lower elevation sagebrush, take longer to recover from disturbance, especially during prolonged drought, and are more susceptible to weed invasion. Impacts on these communities would be greater than for other

desired vegetation communities, such as mountain shrub or high-elevation sagebrush, which generally respond more favorably to disturbance and are less prone to weed invasion. Fewer impacts on vegetation would occur in previously disturbed or developed areas. This is because past and current use has already impacted these areas (Marion and Cole 1996), although further impacts could still occur.

Resource use—Resource use impacts include vegetation consumption by livestock. Such impacts include changes to the native vegetation condition through vegetation removal, nutrient cycling rate changes (de Mazancourt et al. 1998), and species composition (Milchunas and Lauenroth 1993; Hayes and Holl 2003). For example, a comparison of ungrazed and grazed plots in GSENM showed higher amounts of bare ground, annual grass cover, and shrub cover on grazed plots. While ungrazed plots had less shrub cover, these sites showed increased shrub diversity, with six species of shrubs not found in grazed sites (Guenther et al. 2004).

Improper management of livestock grazing can also change vegetation condition by reducing palatable species, thereby giving a competitive advantage to unpalatable species. Livestock often use riparian and wetland{ XE "Wetland" } areas for water and shade, which could reduce the riparian community condition and hydrologic functionality. Furthermore, grazing can reduce litter and fine fuel loading, which could reduce fire size and severity. Impacts would vary, depending on the timing of use, duration, type of vegetation impacted, and grazing intensity. In general, while livestock grazing management would play a large role in determining the extent of impacts, the more acres that are open to grazing, the higher the AUMs permitted. The higher the AUMs per acre under a given alternative, the greater the acreage that could be subject to the impacts listed above to varying degrees.

Riparian and Wetland{ XE "Wetland" } Vegetation

Livestock grazing would impact riparian and wetland{ XE "Wetland" } vegetation to varying degrees, depending on the timing of use, duration, type of vegetation impacted, and grazing intensity. As acres available and AUMs increase for livestock, there would be a corresponding increase in the impacts on riparian and wetland vegetation. Direct impacts would be from the following (Behnke and Raleigh 1978; Connelly et al. 2004; Knick et al. 2011; Manier et al. 2013):

- Trampling
- Removal of vegetation through herbivory
- Reduced plant cover, height, and vegetation litter
- Soil compaction
- Increased soil erosion and bank shearing in areas where livestock congregate
- Changes to species composition over the short and long terms

Livestock can transport weeds by passing seed through their digestive systems or transporting seeds attached to hair (DiTomaso 2000). Indirectly, this would lead to weed spread into riparian and wetland{ XE "Wetland" } areas over the short and long terms.

In addition, livestock often use riparian and wetland{ XE "Wetland" } areas in the summer for water and shade. This may concentrate livestock use and have direct impacts on vegetation

conditions through reduced plant cover and trampling, soil compaction, and erosion (Belsky et al. 1999). These impacts would reduce the ability of an area to revegetate naturally.

Range improvements{ XE "Range Improvement" } or management that excludes livestock or that attracts them away from riparian and wetland{ XE "Wetland" } areas would also maintain riparian and wetland areas by reducing disturbance from livestock (Belsky et al. 1999). In riparian and wetland areas where livestock grazing is excluded, vegetation would be allowed to recover. This would have indirect impacts on riparian and wetland vegetation by increasing vegetation height, cover, and vigor (Sarr 2002), depending on the condition of the area.

4.4.4 Direct and Indirect Impacts

Impacts Common to Alternatives A, C, D, and E

While permitted AUMs vary across alternatives, the density of average actual use AUMs only varies slightly, between 49 and 52 acres available per AUM. There are 52 acres available per AUM under Alternative E, 51 acres available per AUM for Alternative A, 50 acres available per AUM for Alternative D, and 49 acres available per AUM for Alternative C. In addition, and all livestock management would use the BLM Utah Standards for Rangeland Health{ XE "Rangeland Health" } and Guidelines for Livestock Grazing Management. In addition, under Alternatives A, C, D, and E, water developments could have an overall beneficial impact on vegetation resources, including native species and riparian areas{ XE "Riparian Area" } and shut-off valves would be installed on water developments to prevent riparian areas from being dewatered. These range improvements{ XE "Range Improvement" } would help meet BLM Utah Rangeland Health Standards in GSENM and Glen Canyon and additional NPS desired vegetation standards in Glen Canyon under these alternatives. This would come about by increasing the amount, type, and distribution of native species and by maintaining the hydrologic regime in riparian areas.

Long-term impacts on vegetation productivity can be mitigated by implementing grazing systems, such as rest-rotation, grazing outside of the time when forage is most susceptible to damage (usually spring{ XE "Spring" }), and reduced use.

Alternative A

Current management would continue and impacts on vegetation would be the same as those described under the *Nature and Type of Impacts*. **Table 4-2**, Livestock Grazing Allocations by Vegetation Type, Alternative A, is a summary of acreage-based livestock grazing allocations in NVCS vegetation macrogroups for Alternative A. Rocky Mountain Two-Needle Pinyon-Juniper Woodland, Great Basin and Intermountain Dry Shrubland and Grassland, and Barren NVCS macrogroups would have the greatest acreage available, representing 91, 92, and 82 percent, respectively, of the total acreage of those macrogroups in the decision area. Under Alternative A, 76,957 AUMs are active.

Management would be implemented to increase the potential to meet BLM Utah Rangeland Health{ XE "Rangeland Health" } Standards (and additional NPS desired vegetation standards in Glen Canyon). Management would include using soil protection measures, placing livestock salt blocks and other nutritional supplements away from riparian and wetland{ XE "Wetland" }

areas, following weed management guidance, excluding livestock after seedings{ XE "Seeding" }, and managing areas for season-of-use.

In addition, the NPS would implement vegetation management to maintain naturally diverse plant communities and species populations. Management of vegetation would include maximum utilization{ XE "Utilization" } rates, grazing season adjustments, and control of undesirable species in Glen Canyon. Such management would increase the potential for meeting BLM Utah Rangeland Health{ XE "Rangeland Health" } Standards and additional NPS desired vegetation standards.

Table 4-2
Livestock Grazing Allocations by Vegetation Type, Alternative A

NVCS Macrogroup	Available for Grazing	Reserve Common Allotment	Trailing Only{ XE "Trailing Only" }	Unavailable for Grazing	Unalloted
Rocky Mountain Two-Needle Pinyon-Juniper Woodland	611,300	2,900	1,600	23,800	26,400
Great Basin and Intermountain Dry Shrubland and Grassland	588,500	3,700	300	43,900	1,200
Barren	296,900	6,200	8,900	44,300	2,600
Great Basin and Intermountain Tall Sagebrush Shrubland and Steppe	164,400	500	2,100	4,400	1,100
Great Basin Saltbrush Scrub	143,500	100	300	1,500	0
Intermountain Basin Cliff, Scree, and Rock Vegetation	124,500	1,000	2,300	12,300	1,500
Introduced and Semi-Natural Vegetation	52,700	100	100	2,700	400
Rocky Mountain and Great Basin Flooded and Swamp Forest	26,700	0	100	2,600	900
Cool Semi-Desert Alkali-Saline Wetland{ XE "Wetland" }	8,200	0	0	100	100
Great Basin and Intermountain Dwarf Sagebrush Shrubland and Steppe	4,300	0	0	0	300
Southern Rocky Mountain Lower Montane Forest	2,100	0	0	0	400
Southern Rocky Mountain Montane Grassland and Shrubland	3,300	0	0	100	100

Table 4-2
Livestock Grazing Allocations by Vegetation Type, Alternative A

NVCS Macrogroup	Available for Grazing	Reserve Common Allotment	Trailing Only{ XE "Trailing Only" }	Unavailable for Grazing	Unalloted
Intermountain Singleleaf Pinyon-Western Juniper Woodland	1,700	0	0	1,100	0
Developed and Urban	5,800	100	0	200	300
Other Vegetation Types[1]	3,700	0	100	200	100

Source: BLM GIS 2014
[1]Represents ecological systems that cover fewer than 2,000 acres within the decision area.

Nonnative species would not be used to increase forage for livestock in GSENM. This could hinder the ability to meet the BLM Utah's Land Health Standards, if nonnative species could be used to stabilize soils for vegetation communities to become established. No nonstructural range improvements{ XE "Range Improvement" } would be implemented in Glen Canyon, which would limit the potential for meeting BLM Utah Rangeland Health{ XE "Rangeland Health" } Standards and additional NPS desired vegetation standards in this area.

Alternative B

The discontinuance of livestock grazing in the decision area would greatly reduce impacts described under the *Nature and Type of Impacts*, through passive restoration. Passive restoration can be ecologically effective and economically efficient for recovering altered ecosystems. It addresses the root causes of degradation and allows natural recovery processes to operate (Beschta et al. 2012). For instance, livestock removal is thought to decrease soil compaction, thereby increasing water infiltration and allowing for the reestablishment of perennial{ XE "Perennial" } grasses (Castellano and Valone 2007). This recovery may take over 20 years (Castellano and Valone 2007). In addition, livestock removal has been shown to increase herbaceous vegetation density in riparian areas{ XE "Riparian Area" } (Krueper et al. 2003).

However, removing livestock grazing alone may not necessarily increase the potential for meeting BLM Utah Rangeland Health{ XE "Rangeland Health" } Standards in GSENM and Glen Canyon and additional NPS desired vegetation standards in Glen Canyon, compared with Alternative A. This is because research suggests that understory herbaceous productivity does not increase in depleted sagebrush ranges when livestock grazing is removed (Beck and Mitchell 2000). As such, restoration efforts would also need to be implemented.

Only native species would be allowed to be used for restoration in GSENM, which could limit the potential for meeting BLM Utah Rangeland Health{ XE "Rangeland Health" } Standards, compared with Alternative A. This would be the case if native species were unavailable. No nonstructural range improvements{ XE "Range Improvement" } would be implemented in Glen Canyon, having impacts as described under Alternative A.

Alternative C

Under Alternative C, the BLM would reduce the acres available for grazing (23 percent reduction, compared with Alternative A) and active AUMs (18 percent reduction from Alternative A). Such reductions in permitted use would reduce the impact of grazing on vegetation and would improve the likelihood for meeting BLM Utah Rangeland Health{ XE "Rangeland Health" } Standards in GSENM and Glen Canyon and additional NPS desired vegetation standards in Glen Canyon, compared with Alternative A. **Table 4-3**, Livestock Grazing Allocations by Vegetation Type, Alternative C, is a summary of acreage-based livestock grazing allocations in NVCS vegetation macrogroups for Alternative C. Great Basin and Intermountain Dry Shrubland, Rocky Mountain Two-Needle Pinyon-Juniper Woodland, and Grassland, and Barren NVCS macrogroups would have the greatest acreage available. They represent 79, 65, and 65 percent, respectively, of the total acreage of those macrogroups in the decision area.

In addition, Alternative C includes stringent objectives for vegetation, including an increase in native plant diversity and improved function of riparian and wetland{ XE "Wetland" } areas, compared with ungrazed reference sites. These large, ungrazed reference areas would be managed to measure progress toward meeting or achieving the vegetation objectives included under this alternative. Further, livestock exclusion after seedings{ XE "Seeding" } would be at least two growing seasons or until most native plant species have seeded.

In GSENM, the BLM would restrict the season of use and apply enhanced soil conservation measures, compared with Alternative A. Light grazing utilization{ XE "Utilization" } would be instituted for riparian and upland areas in both GSENM and Glen Canyon. In Glen Canyon, vegetation management

Table 4-3
Livestock Grazing Allocations by Vegetation Type, Alternative C

NVCS Macrogroup	Available for Grazing	Reserve Common Allotment	Trailing Only{ XE "Trailing Only" }	Unavailable for Grazing
Rocky Mountain Two-Needle Pinyon-Juniper Woodland	438,800	0	11,700	215,400
Great Basin and Intermountain Dry Shrubland and Grassland	502,300	0	200	135,100
Barren	234,800	0	500	123,600
Great Basin and Intermountain Tall Sagebrush Shrubland and Steppe	127,500	0	800	44,300
Great Basin Saltbrush Scrub	125,800	0	0	19,600
Intermountain Basin Cliff, Scree, and Rock Vegetation	100,800	0	700	40,000

Table 4-3
Livestock Grazing Allocations by Vegetation Type, Alternative C

NVCS Macrogroup	Available for Grazing	Reserve Common Allotment	Trailing Only{ XE "Trailing Only" }	Unavailable for Grazing
Introduced and Semi-Natural Vegetation	44,000	0	400	11,600
Rocky Mountain and Great Basin Flooded and Swamp Forest	20,000	0	300	10,100
Cool Semi-Desert Alkali-Saline Wetland{ XE "Wetland" }	7,300	0	0	1,000
Great Basin and Intermountain Dwarf Sagebrush Shrubland and Steppe	3,500	0	200	1,000
Southern Rocky Mountain Lower Montane Forest	1,900	0	100	600
Southern Rocky Mountain Montane Grassland and Shrubland	2,900	0	0	600
Intermountain Singleleaf Pinyon-Western Juniper Woodland	1,400	0	0	1,400
Developed and Urban	5,100	0	200	1,100
Other Vegetation Types[1]	2,700	0	0	1,300

Source: BLM GIS 2014
[1]Represents ecological systems that cover fewer than 2,000 acres within the decision area.

would be similar to that described for Alternative A, but with a reduced maximum utilization{ XE "Utilization" } rate in all key areas. Together, these management actions would increase the likelihood of meeting BLM Utah Rangeland Health{ XE "Rangeland Health" } Standards in GSENM and Glen Canyon and additional NPS desired vegetation standards in Glen Canyon, compared with Alternative A. This would come about by reducing the impacts from livestock grazing on vegetation, as described under the *Nature and Type of Impacts*, and increasing the amount, type, and distribution of native vegetation.

Impacts from management of nonstructural range improvements{ XE "Range Improvement" } would be similar to those described under Alternative B. Under Alternative C, the BLM and NPS would prioritize passive restoration and non-chemical methods to prevent nonnative invasive plants{ XE "Invasive Species" } from becoming established or spreading. The permittee would maintain areas free of noxious and nonnative invasive plant species around structural range improvements. This would increase the likelihood of meeting BLM Utah Rangeland Health{ XE "Rangeland Health" } Standards in GSENM and Glen Canyon and additional NPS desired vegetation standards in Glen Canyon, compared with Alternative A.

Alternative D

Under Alternative D, the BLM would increase both the acres available for grazing (2 percent increase, compared with Alternative A) and active AUMs (40 percent increase, compared with Alternative A). While there would be more acres available for livestock grazing and also more active AUMs than under Alternative A and although Alternative D would emphasize structural and nonstructural range improvements{ XE "Range Improvement" } that would better distribute livestock, the pattern of livestock use is still likely to be similar to current distribution. Therefore, because more livestock would be on the landscape, there is an increased likelihood that grazing would impact vegetation, making it increasingly difficult to meet BLM Utah Rangeland Health{ XE "Rangeland Health" } Standards in GSENM and Glen Canyon and additional NPS desired vegetation standards in Glen Canyon, compared with Alternative A.

Table 4-4, Livestock Grazing Allocations by Vegetation Type, Alternative D, is a summary of acreage-based livestock grazing allocations in NVCS vegetation macrogroups under Alternative D. Rocky Mountain Two-Needle Pinyon-Juniper Woodland, Great Basin and Intermountain Dry Shrubland and Grassland, and Barren NVCS macrogroups would have the greatest acreage available, representing 97, 92, and 91 percent, respectively, of the total acreage of those macrogroups in the decision area.

Impacts from vegetation management in Glen Canyon would be the same as those described for Alternative A. Impacts from managing the season of use would be similar to those for Alternative A, but Alternative D also includes management of duration, distribution, and stocking rate{ XE "Stocking Rate" }. In addition, livestock exclusion after seedings{ XE "Seeding" } would be two growing seasons or until site objectives are met. A variety of vegetation treatment{ XE "Vegetation Treatment" } methods would be allowed. They would prevent the establishment or spread of State listed noxious species and other nonnative invasive plants{ XE "Invasive Species" }, including County designated species. Despite these management actions, due to the increase in acres available for grazing and active AUMs under Alternative D, there is an increased likelihood that grazing would impact vegetation at a rate that would outpace the management to improve vegetation. Thus, it would be increasingly difficult to meet BLM Utah Rangeland Health{ XE "Rangeland Health" } Standards in GSENM and Glen Canyon and additional NPS desired vegetation standards in Glen Canyon under Alternative D, compared with Alternative A.

Impacts from managing nonstructural range improvements{ XE "Range Improvement" } would be similar to those described under Alternative A, though new seedings{ XE "Seeding" } would be allowed under Alternative D. In Glen Canyon, nonstructural range improvements may be approved on a site-specific basis but not to increase forage for livestock. While such management would increase the amount, type, and distribution of desired species, the increase in acres available for grazing and active AUMs under Alternative D would increase the likelihood that grazing would impact vegetation at a rate that would outpace the management to improve vegetation. Thus, it would be increasingly difficult to meet BLM Utah Rangeland Health{ XE "Rangeland Health" } Standards in GSENM and Glen Canyon and additional NPS desired vegetation standards in Glen Canyon under Alternative D, compared with Alternative A.

Table 4-4
Livestock Grazing Allocations by Vegetation Type, Alternative D

NVCS Macrogroup	Available for Grazing	Reserve Common Allotment	Trailing Only{ XE "Trailing Only" }	Unavailable for Grazing
Rocky Mountain Two-Needle Pinyon-Juniper Woodland	650,100	0	0	15,900
Great Basin and Intermountain Dry Shrubland and Grassland	595,100	0	0	42,500
Barren	327,500	0	0	31,400
Great Basin and Intermountain Tall Sagebrush Shrubland and Steppe	171,000	0	0	1,500
Great Basin Saltbrush Scrub	144,400	0	0	1,000
Intermountain Basin Cliff, Scree, and Rock Vegetation	132,200	0	0	9,200
Introduced and Semi-Natural Vegetation	53,600	0	0	2,400
Rocky Mountain and Great Basin Flooded and Swamp Forest	28,900	0	0	1,500
Cool Semi-Desert Alkali-Saline Wetland{ XE "Wetland" }	8,300	0	0	100
Great Basin and Intermountain Dwarf Sagebrush Shrubland and Steppe	4,700	0	0	0
Southern Rocky Mountain Lower Montane Forest	2,600	0	0	0
Southern Rocky Mountain Montane Grassland and Shrubland	3,500	0	0	0
Intermountain Singleleaf Pinyon-Western Juniper Woodland	1,900	0	0	1,000
Developed and Urban	6,200	0	0	200
Other Vegetation Types[1]	3,900	0	0	100

Source: BLM GIS 2014
[1]Represents ecological systems that cover fewer than 2,000 acres within the decision area.

Alternative E

Under Alternative E, the BLM would reduce the acres available for grazing (1 percent reduction, compared with Alternative A) and active AUMs (1 percent reduction, compared with Alternative A). Such reductions would reduce the impact of grazing on vegetation in areas that would be unavailable to grazing; however, they would increase the impact, as identified in the

Nature and Type of Impacts, in areas available to grazing, where this could reduce the likelihood for meeting BLM Utah Rangeland Health{ XE "Rangeland Health" } Standards in GSENM and Glen Canyon and additional NPS desired vegetation standards in Glen Canyon, compared with Alternative A.

Table 4-5, Livestock Grazing Allocations by Vegetation Type, Alternative E, is a summary of acreage-based livestock grazing allocations in NVCS vegetation macrogroups for Alternative E. Rocky Mountain Two-Needle Pinyon-Juniper Woodland, Great Basin and Intermountain Dry Shrubland and Grassland, and Barren NVCS macrogroups would have the greatest acreage available, representing 93, 92, and 83 percent, respectively, of the total acreage of those macrogroups in the decision area. In addition, the BLM would increase the acreage managed as a reserve common allotment{ XE "Reserve Common Allotment" }, which would assist in land restoration.

Use of ungrazed reference areas would have impacts as described for Alternative C. Impacts from livestock exclusion would be the same as those described for Alternative D. Impacts from season of use management would be similar to Alternative D but would also be intended to reduce conflicts with other resources, as noted in **Table 2-2**, Rationale for Unavailable Allotments. Impacts from vegetation management in Glen Canyon would be the same as those described under Alternative A. Together, these management actions would increase the likelihood for meeting BLM Utah Rangeland Health{ XE "Rangeland Health" } Standards in GSENM and Glen Canyon and additional NPS desired vegetation standards in Glen Canyon, compared with Alternative A. This is because the emphasis under this alternative would be on sustainable yield and improvement in land health.

Impacts from managing nonstructural range improvements{ XE "Range Improvement" } in GSENM would be similar to those described under Alternative D; however, they may be more effective under Alternative E, given its reduction in acres and AUMs available for grazing. Impacts from managing nonstructural range improvements in Glen Canyon would be the same as those described under Alternative D.

4.4.5 Cumulative Impacts

The cumulative impacts analysis area for vegetation is the planning area.

Vegetation communities in the planning area have historically been affected primarily by invasive species{ XE "Invasive Species" } conversion and uncharacteristic native vegetation (such as pinyon-juniper expansion). Depending on the characteristics of the plant community and the type and intensity of grazing, livestock grazing has also had impacts on vegetation, such as changes in plant species composition, aboveground primary productivity, and root and soil attributes (Milchunas 2006).

Human visitation has also likely impacted vegetation through trampling and increasing the potential to introduce and spread invasive plants{ XE "Invasive Species" } and noxious weeds{ XE "Noxious Weed" }. Trail proliferation in riparian and wetland{ XE "Wetland" } areas can damage or destroy the vegetation. Departures from reference conditions for upland vegetation identified in Rangeland Health{ XE "Rangeland Health" } Assessments{ XE "Rangeland Health, Assessment" } include soil erosion and loss, exotic invasion, loss of species composition,

reduction in biological soil crust{ XE "Biological Soil Crust" }, and shift in functional and structural groups (BLM 2006). PFC assessments showed impacts from heavy use by livestock of riparian and wetland areas, such as increased sloughing and bank erosion from hoof action and trampling of vegetation near springs{ XE "Spring" }, in many of the allotments assessed.

Table 4-5
Livestock Grazing Allocations by Vegetation Type, Alternative E

NVCS Macrogroup	Available for Grazing	Reserve Common Allotment	Trailing Only{ XE "Trailing Only" }	Unavailable for Grazing
Rocky Mountain Two-Needle Pinyon-Juniper Woodland	618,300	3,400	11,700	32,500
Great Basin and Intermountain Dry Shrubland and Grassland	586,200	6,600	200	44,600
Barren	297,700	7,600	500	53,200
Great Basin and Intermountain Tall Sagebrush Shrubland and Steppe	164,100	600	800	7,100
Great Basin Saltbrush Scrub	143,500	100	0	1,700
Intermountain Basin Cliff, Scree, and Rock Vegetation	125,200	1,100	700	14,500
Introduced and Semi-Natural Vegetation	52,600	100	400	2,900
Rocky Mountain and Great Basin Flooded and Swamp Forest	27,200	0	300	2,700
Cool Semi-Desert Alkali-Saline Wetland{ XE "Wetland" }	8,200	0	0	100
Great Basin and Intermountain Dwarf Sagebrush Shrubland and Steppe	4,500	0	200	0
Southern Rocky Mountain Lower Montane Forest	2,400	0	100	0
Southern Rocky Mountain Montane Grassland and Shrubland	3,300	0	0	200
Intermountain Singleleaf Pinyon-Western Juniper Woodland	1,700	0	0	1,100
Developed and Urban	5,900	100	200	200
Other Vegetation Types[1]	3,800	0	0	600

Source: BLM GIS 2014
[1]Represents ecological systems that cover fewer than 2,000 acres within the decision area.

Other impacts were dewatering, loss of riparian and wetland{ XE "Wetland" } vegetation, poor recruitment of native species, and replacement of native species by tamarisk, Russian olive, and annual grasses and forbs. In many areas, a change to existing grazing administration would be needed to meet or make significant progress toward meeting the rangeland health{ XE "Rangeland Health" } standard for riparian and wetland areas (BLM 2006).

Pinyon-juniper woodlands have continued to expand over the last century into grassland and shrubland ecosystems throughout the western United States. Livestock grazing, changes in fire regimes, and increasing atmospheric carbon dioxide concentrations are thought to be more recent drivers of pinyon-juniper woodland distribution (Barger et al. 2009).

Climate change{ XE "Climate Change" } may affect vegetation in the future, particularly as temperature increases interact with water limitations. In many vegetation communities, the canopy cover of perennial{ XE "Perennial" } plants has been shown to be sensitive to temperature, whereas the canopy cover of annual plants responds to cool season precipitation (Munson et al. 2011). REA models predict increasing temperatures in all seasons. For 2015 to 2030, reductions in both the winter and summer precipitation (reduction in the monsoon) are expected; for 2045 to 2060, a slight increase in annual precipitation is expected, particularly during winter.

If both winter and summer precipitation is reduced, trees, especially pinyon pine, and grasses may be reduced (Schwinning et al. 2008, in Bryce et al. 2012; Munson et al. 2011; Barger et al. 2009); shrubs are likely to continue to expand (Munson et al. 2011). For woody species, drought-induced water stress has been linked to bark beetle infestations, leading to die-offs (Breshears et al. 2005). However, interspecies competition may play a role in mediating the impacts of climate change (Derner et al. 2003). Livestock grazing may make lands more susceptible to the impacts of climate change through additional stressors, such as compacted soils, decreased biotic crusts and litter cover, and trampled streambanks (Beschta et al. 2012).

Focused efforts have limited the spread and reduced the size of invasive plant{ XE "Invasive Species" } populations in some areas. For instance, Glen Canyon regularly conducts invasive vegetation management projects, including mechanical removal of invasive species and native plant restoration (**Table 4-1**, Past, Present, and Reasonably Foreseeable Projects, Plans, or Actions that Comprise the Cumulative Impact Scenario). This practice is expected to continue.

Results from PFC assessments indicate that the BLM's change to grazing management in riparian areas{ XE "Riparian Area" } has improved rangeland health{ XE "Rangeland Health" }.

Under the MMP{ XE "Monument Management Plan, Grand Staircase-Escalante National Monument (MMP 2000)" }-A alternatives, the BLM and NPS would work toward achieving BLM Utah Rangeland Health{ XE "Rangeland Health" } Standards in GSENM and Glen Canyon and additional NPS desired vegetation standards in Glen Canyon; however, the alternatives would differ in the time and methods used to reach that goal. Vegetation conditions would be improved through grazing management, vegetation treatments{ XE "Vegetation Treatment" }, structural and nonstructural range improvements{ XE "Range Improvement" }, and weed prevention and control measures.

Among the alternatives, Alternative B would have the greatest likelihood of reducing potential impacts associated with livestock grazing, due to the removal of livestock from the decision area. Alternative D would have the greatest likelihood of increasing potential impacts associated with livestock grazing, due to its allowance for greater available acreage for grazing and increased AUMs within the decision area.

4.4.6 References

Barger, N. N., H. D. Adams, C. Woodhouse, J. C. Neff, and G. P. Asner. 2009. "Influence of livestock grazing and climate on pinyon pine (*Pinus edulis*) dynamics." *Rangeland Ecology and Management* 62:531-539.

Beck, J. L., and D. L. Mitchell. 2000. "Influences of livestock grazing on sage grouse habitat." *Wildlife Society Bulletin* 28(4):993-1002.

Behnke, R. J., and R. F. Raleigh. 1978. "Grazing and the riparian zone: Impact and management perspectives." *In:* Strategies for Protection and Management of Floodplain Wetlands{ XE "Wetland" } and Other Riparian Ecosystems. USDA Forest Service GTR-WO-12. Pp. 184-189.

Belsky, A. J., A. Matzke, and S. Uselman. 1999. "Survey of livestock influences on stream and riparian ecosystems in the western United States." *Journal of Soil and Water Conservation* 54:419-431.

Beschta, R. L., D. L. Donahue, D. A. DellaSala, J. J. Rhodes, J. R. Karr, M. H. O'Brien, T. L. Fleischner, and C. Deacon Williams. 2012. Adapting to Climate Change on Western Public Lands: Addressing the Ecological Effects of Domestic, Wild, and Feral Ungulates. Environmental Management DOI 10.1007/s00267-012-9964-9.

BLM (United States Department of the Interior, Bureau of Land Management). 2006. Rangeland Health{ XE "Rangeland Health" } Determination. BLM, Grand Staircase-Escalante National Monument, Utah.

BLM GIS. 2014. Base GIS data on file with BLM's eGIS Server used to describe the GSENM decision area and planning boundary. BLM, Grand Staircase-Escalante National Monument, Utah. Updated through July 2014.

Breshears, D. D., N. S. Cobb, P. M. Rich, K. P. Price, C. D. Allen, R. G. Balice, W. H. Romme, et al. 2005. "Regional vegetation die-off in response to global-change-type drought." *PNAS* 102(42):15144-15148.

Bryce, S. A., J. R. Strittholt, B. C. Ward, and D. M. Bachelet. 2012. Colorado Plateau Rapid Ecoregional Assessment Report. Prepared for the US Department of the Interior, Bureau of Land Management, Denver, Colorado.

Burton, T. A., E. R. Cowley, and S. J. Smith. 2008. Monitoring Stream Channels and Riparian Vegetation – Multiple Indicators. Version 5.0. US Department of the Interior. Bureau of Land Management. Idaho State Office. Boise, Idaho.

Castellano, M. J., and T. J. Valone. 2007. "Livestock, soil compaction and water infiltration rate: Evaluating a potential desertification recovery mechanism." *Journal of Arid Environments* 71:97-108.

Connelly, J. W., S. T. Knick, M. A. Schroeder, and S. J. Stiver. 2004. Conservation Assessment of Greater Sage-Grouse{ XE "Greater Sage-Grouse" } and Sagebrush Habitats. Unpublished report. Western Association of Fish and Wildlife Agencies. Cheyenne, Wyoming.

Crone, E. E., M. Marler, and D. E. Pearson. 2009. "Non-target effects of broadleaf herbicide on a native perennial{ XE "Perennial" } forb: A demographic framework for assessing and minimizing impacts." *Journal of Applied Ecology* 46:673-682.

de Mazancourt, C., M. Loreau, and L. Abbadie. 1998. "Grazing optimization and nutrient cycling: When do herbivores enhance plant production?" *Ecology* 79(7):2242-2252.

Derner, J. D., H. B. Johnson, B. A. Kimball, P. J. Pinter, Jr., H. W. Polley, C. R. Tischler, T. W. Boutton, et al. 2003. "Above- and below-ground responses of C3-C4 species mixtures to elevated CO_2 and soil water availability." *Global Change Biology* 9:452-460.

DiTomaso, J. M. 2000. "Invasive weeds in rangelands: Species, impacts, and management." *Weed Science* 48(2):255-265.

Guenther, D. A., T. J. Stohlgren, and P. Evangelista. 2004. A comparison of a near-relict site and a grazed site in a pinyon-juniper community in the Grand Staircase - Escalante National Monument, Utah. In: The Colorado Plateau: Cultural, Biological, and Physical Research (C. van Riper III, and K. L. Cole, editors). The University of Arizona Press, Tucson. Pp. 153-162.

Hayes, G. F., and K. D. Holl. 2003. "Cattle grazing impacts on annual forbs and vegetation composition of mesic grasslands in California." *Conservation Biology* 17(6):1694-1702.

Knick S. T., S. E. Hanser, R. F. Miller, D. A. Pyke, M. J. Wisdom, S. P. Finn, E. T. Rinkes, and C. J. Henny. 2011. "Ecological influence and pathways of land use in sagebrush." In: "Greater sage-grouse: Ecology and conservation of a landscape species and its habitats." *Studies in Avian Biology* 38:203-251. University of California Press, Berkeley.

Krueper, D., J. Bart, and T. D. Rich. 2003. "Response of vegetation and breeding birds to the removal of cattle on the San Pedro River, Arizona (USA)." *Conservation Biology* 17(2):607-615.

Manier, D. J., D. J. A. Wood, Z. H. Bowen, R. M. Donovan, M. J. Holloran, L. M. Juliusson, K. S. Mayne, et al. 2013. Summary of Science, Activities, Programs, and Policies That Influence the Rangewide Conservation of Greater Sage-Grouse{ XE "Greater Sage-Grouse" } (*Centrocercus urophasianus*). USGS Open-File Report 2013–1098. Internet website: http://pubs.usgs.gov/of/2013/1098/.

Marion, J. L., and D. N. Cole. 1996. "Spatial and temporal variation in soil and vegetation impacts on campsites." *Ecological Applications* 6(2):520-530.

Merriam, K. E., J. E. Keeley, and J. L. Beyers. 2006. "Fuel breaks affect nonnative species abundance in Californian plant communities." *Ecological Applications* 16(2):515-527.

Milchunas, D. G. 2006. Responses of plant communities to grazing in the southwestern United States. Gen. Tech. Rep. RMRS-GTR-169. US Department of Agriculture, Forest Service, Rocky Mountain Research Station, Fort Collins, Colorado.

Milchunas, D. G., and W. K. Lauenroth. 1993. "Quantitative effects of grazing on vegetation and soils over a global range of environments." *Ecological Monographs* 63(4):327-366.

Munson, S. M., J. Belnap, C. D. Schelz, M. Moran, and T. W. Carolin. 2011. "On the brink of change: Plant responses to climate on the Colorado Plateau." *Ecosphere* 2(6):art68. doi:10.1890/ES11-00059.1.

Ouren, D. S., C. Haas, C. P. Melcher, S. C. Stewart, P. D. Ponds, N. R. Sexton, L. Burris, et al. 2007. Environmental Effects of Off-Highway Vehicles on Bureau of Land Management Lands: A Literature Synthesis, Annotated Bibliographies, Extensive Bibliographies, and Internet Resources. US Department of the Interior, US Geological Survey, Open-File Report 2007-1353.

Peterson, E. B. 2013. "Regional-scale relationship among biological soil crusts**{** XE "Biological Soil Crust" **}**, invasive annual grasses, and disturbance." *Ecological Processes* 2(2):1-8.

Reisner, M. D., J. B. Grace, D. A. Pyke, and P. S. Doescher. 2013. "Conditions favoring *Bromus tectorum* dominance of endangered sagebrush steppe ecosystems." *Journal of Applied Ecology* 50:1039-1049.

Sakai, A. K., F. W. Allendorf, J. S. Holt, D. M. Lodge, J. Molofsky, et al. 2001. "The population biology of invasive species**{** XE "Invasive Species" **}**." *Annual Review of Ecology and Systematics* 32:305-332.

Sarr, D. A. 2002. "Riparian livestock exclosure research in the western United States: A critique and some recommendations." *Environmental Management* 30(4):516-526.

Wagner, S., H. Fischer, and F. Huth. 2010. "Canopy effects on vegetation caused by harvesting and regeneration treatments." *European Journal of Forest Research* 130:17-40.

4.5 Soil Resources

This section discusses impacts on soils from proposed management actions. Existing conditions are described in **Section 3.3**, Soil Resources.

4.5.1 Methods of Analysis

Impacts were determined by assessing which actions, if any, would change the distribution, health, and composition of soil resources. Some impacts are direct, while others are indirect and affect soil resources through a change in another resource. Direct impacts on soil resources

include eroding, compacting, or disturbing soils. Indirect impacts are those that occur later in time or farther removed in distance, such as decreased plant vigor or health that increases the potential for erosion of surface soils.

In addition to the assumptions in **Section 4.1.1**, the analysis assumes the following:

- Soil resources will be managed to meet BLM Utah Rangeland Health{ XE "Rangeland Health" } Standards and Guidelines for Grazing Management. On NPS-managed lands, additional criteria beyond BLM Utah Rangeland Health Standards may be required as specified in the 1999 GzMP{ XE "Grazing Management Plan, Glen Canyon (GzMP 1999)" } and other NPS policies. Achieving or maintaining BLM Utah Rangeland Health Standards generally is effective in managing the impacts on soils from livestock grazing.
- Grazing authorizations, including the timing, duration, or frequency of permitted use, will be adjusted on a case-by-case basis, when site-specific studies indicate changes in management are needed.
- Soils will be managed to minimize erosion and maintain soil productivity.
- Recovery rates for biological soil crusts{ XE "Biological Soil Crust" } after a disturbance are dependent on many factors, including disturbance type, severity, and extent; vascular plant community structure; adjoining substrate condition; inoculation material availability; and climate during and after the disturbance (US DOI 2001). As a result, comparing recovery rates reported in literature is highly problematic. Therefore, biological soil crusts are not good short-term indicators of the appropriateness of reclamation and rehabilitation management actions.
- As slopes increase, the risk of soil instability following disturbance increases, particularly if cover, structure, permeability, or bulk density has been altered (Monsen et al. 2004).
- Soils with high erodibility have a significantly lower probability of success for restoration than soils with less erosion potential.

4.5.2 Factors for Analysis

Factors for analysis of impacts on soils are the following:

- Potential for meeting BLM Utah Rangeland Health{ XE "Rangeland Health" } Standards, as affected by
  - Changes in acres available for livestock grazing
  - Changes in acres available for livestock grazing with sensitive soils or biological soil crust{ XE "Biological Soil Crust" } cover
  - Changes in AUMs allocated for livestock
  - Changes in density of AUMs for livestock (acres available per AUM)

– Allowance for or restrictions on the construction or maintenance of new structural and nonstructural range improvements{ XE "Range Improvement" }

On NPS-managed lands, additional criteria beyond BLM Utah Rangeland Health{ XE "Rangeland Health" } Standards may be required as specified in the 1999 GzMP{ XE "Grazing Management Plan, Glen Canyon (GzMP 1999)" } and other NPS policies.

4.5.3 Nature and Type of Impacts

Achieving or maintaining BLM Utah Rangeland Health{ XE "Rangeland Health" } Standards (described in **Section 3.1**, Livestock Grazing) generally is effective in managing the impacts on soils from livestock grazing. However, grazing may have impacts on soil resources from surface-disturbing activities that result in compaction, composition alteration, and erosion. Grazing management can also improve soil conditions.

The intensity and extent of impacts on soil resources are determined in part by the type and location of the surface-disturbing activities. Impacts on soil resources can also be affected by any measures that address site-specific environmental concerns and require mitigation to stabilize soil, to prevent unnecessary erosion, and to revegetate disturbed surfaces.

Surface Disturbance

Surface-disturbing activities can indirectly impact soil resources. Examples are trampling, grazing, or installing structural range improvements{ XE "Range Improvement" } that remove or weaken desirable plant communities. Such improvements are fences, cattle guards, corrals, cabins, or water developments.

Because plants stabilize soils, and biological soil crusts{ XE "Biological Soil Crust" } can protect some soils from the forces of water and wind, the loss of plants and loss or disturbance of biological soil crust can increase the potential for soil erosion. (Manier et al. 2013). However, in instances where biological soil crusts reduce infiltration rates, there is also increased potential for runoff and erosion (Smith, undated). The erosion of soil diminishes soil productivity. Soil resources, especially on steep slopes and in sensitive soils, are susceptible to impacts from surface disturbance and compaction, which can lead to accelerated erosion, soil loss, and reduced productivity. The impacts can be short term or long term, depending on the type, frequency, and intensity of disturbance, the area disturbed, and the time it takes for plant and biological soil crust communities to become reestablished.

Nonstructural range improvements{ XE "Range Improvement" }, such as chemical and mechanical vegetation treatments{ XE "Vegetation Treatment" } and prescribed fires that disturb the ground surface and remove effective ground cover (vegetation and litter accumulation) can indirectly impact soil resources. This can come about by altering the reproductive capabilities of desirable vegetation communities (Manier et al. 2013). Altering the reproductive capabilities of desirable vegetation communities can increase the potential for undesirable plant species (noxious or invasive weeds) to become established. These species may lack soil-stabilizing characteristics, compared with desirable plant species. The impacts can be short term or long term, depending on the type, frequency, and intensity of disturbance, the area disturbed, and the time it takes for plant communities to become reestablished. Also,

nonstructural range improvements that remove undesirable vegetation and allow for the reestablishment of desirable vegetation can aid in developing conditions that reestablish and maintain healthy soil conditions due to the presence of appropriate plant communities. The impacts can be short term or long term, depending on the time it takes for plant communities to become reestablished and revegetation success.

Using prescribed fire as a nonstructural range improvement{ XE "Range Improvement" } can improve soil health where vegetation relies on fire to propagate. Prescribed fire can spread the seeds of certain vegetation, improving vegetation cover and soil stability in the long term. However, in the short term, prescribed fires also leave the ground surface bare and, therefore, more susceptible to erosion by wind and water.

Surface disturbance associated with livestock hoof action can also improve soil health. Impacts can occur when grazing animals help incorporate seeds into soil surfaces. Soil surfaces can also become pocked from animals' hoof marks, helping to trap seeds and moisture essential for establishing desirable vegetation. Pocking also can increase surface roughness in disturbed areas, slowing erosion associated with surface water runoff. The impacts on soil resources from hoofs vary by soil characteristic, slope, aspect, site potential, and intensity and type of livestock use, for example, trailing versus extended grazing (Olson et al. 1997). The impacts can be short term or long term, depending on the frequency and intensity of disturbance, the area disturbed, and the time it takes for plant communities to become reestablished.

Mixing

Mixing soil horizons can also result from surface-disturbing activities, as well as loss of the A horizon, or topsoil, via such erosional forces as wind and water. Mixing topsoil and subsoil and losing the A horizon removes surface cover for erosion control and organic matter inputs for nutrient recycling. The result is decreased soil productivity, which inhibits revegetation, decreases soil reclamation potential, and increases suitability for noxious and invasive species{ XE "Invasive Species" }. However, breaking up soil surfaces through hoof action, pawing, and wallowing can also aide in the incorporation of desirable seeds and organic matter into the soil. These impacts can be short term or long term, depending on the type, frequency, and intensity of disturbance, the area disturbed, and the time it takes for plant communities to become established.

Nutrient Cycling

Grazing affects both soil fertility and soil chemistry. Grazing animals, through herbivory, digestion, and excretion, increase the decomposition rate of organic matter and directly alter the following:

- Amounts of nutrients stored in the soil
- Spatial distribution of those nutrients
- Availability of those nutrients to plants

Grazing indirectly affects soil nutrients through impacts on plant species composition and soil structure. Grazing also appears to affect soil pH, which is generally lower in grazed areas than in ungrazed areas (cited in Roberson 1996).

There is some variability in the scientific literature regarding the nature of the impact of livestock grazing on the total amounts of various nutrients in the soil. The effects of grazing vary, depending on the nutrient studied, the location of the study, and the grazing management system. However, there is little disagreement among researchers that grazing changes soil nutrient status (cited in Roberson 1996).

Also, there is no disagreement that livestock remove many nutrients from the soil and ecosystem. Nutrients are removed as livestock consume plants and convert them into livestock biomass, which is transported off-site. Nutrients are also lost through increased erosion of nutrient-rich surface soil, through accelerated decomposition of litter and organic matter and through leaching. Some nutrients are returned to the ecosystem in livestock feces and urine (cited in Roberson 1996).

Direct comparisons of grazed and ungrazed soils generally find that grazing reduces total soil nutrient levels. Comparing an 80-year-old exclosure with heavily and moderately grazed pastures, researchers found significantly more total soil nitrogen in the exclosure than in the grazed areas. Other study authors report that soil nitrogen and soil carbon were reduced in heavily grazed soils, compared with a 47-year-old exclosure. On the other hand, study authors who examined 12 grazed and 12 ungrazed grasslands found more total soil nitrogen in grazed areas. Carbon, however, showed the opposite trend, with grazed grasslands consistently showing lower total carbon levels than grazed areas (cited in Roberson 1996).

Compaction

Surface-disturbing activities that repeatedly disturb or impact the soil, such as the congregation of livestock around riparian and wetland**{** XE "Wetland" **}** areas for water and shade or by water developments, can compact soil by forming dense layers near the surface. In some cases, soil compaction aids in plant establishment and growth. However, too much compaction can decrease the rate of water infiltration and gas exchange. Decreased gas exchange rates can cause aeration problems, induce nitrogen and potassium deficiency, and negatively impact root metabolism. All of these are stressing agents of vegetation and vegetation is a key component of soil stabilization.

As soil compaction increases, the soil's ability to support vegetation diminishes (see, for example, Grzesiak 2009). This is because the resulting increase in bulk density and change in soil structure (loss of porosity) inhibit root system growth and reduce water infiltration. As vegetation, water infiltration, and soil stabilizing crusts are diminished or disrupted, the surface water runoff rates increase, further accelerating the rates of soil erosion. The impacts can be short term or long term, depending on the type, frequency, and intensity of compaction, the area disturbed, and the time it takes for plant communities to become reestablished.

Sensitive Soils

Soils degradation susceptibility is calculated from the standard BLM soil interpretation, Site Degradation Susceptibility. The BLM uses this to rate each soil for its susceptibility to degrade during disturbance. Sensitive soils are more vulnerable to water and wind erosion, salinization, sodification, organic matter and nutrient depletion or redistribution, and loss of adequate rooting depth to maintain desired plant communities. Surface-disturbing activities related to

livestock grazing that occur on sensitive soils may have greater impacts than those that take place in areas of moderate or low susceptibility.

Biological Soil Crusts

According to a study performed by Bowker et al. (2008), biological soil crusts{ XE "Biological Soil Crust" } are a primary factor in the acceleration or reduction of soil erosion in some soils in arid landscapes, such as in GSENM. Biological soil crusts are especially sensitive to surface-disturbing activities related to livestock grazing, such as structural range improvements{ XE "Range Improvement" } or trampling of soils (Memmott et al. 1998).

After a disturbance, the recovery period for biological soil crusts{ XE "Biological Soil Crust" } varies depending on the severity, frequency, timing, and type of disturbance; the local soil moisture regime; precipitation; and soil and species type (US DOI 2001). While the recovery period may be shorter, it may also take up to 50 to 100 years to recover. Biological soil crusts could be compressed or dispersed during surface disturbance, eliminating their contributions to soil stabilization, hydrologic processes, nutrient cycling, and biological diversity in rangeland ecosystems (Miller 2008, p. 251).

After such disturbances as prescribed fire, cyanobacterial cover generally increases, while moss and lichen cover decreases, reducing the overall species richness of the crusts and making total crust cover a poor measure of crust recovery (US DOI 2001; Belnap and Eldridge 2001). A reduction in moss and lichen decreases soil stability of biological soil crusts{ XE "Biological Soil Crust" }. The complete destruction of biological soil crusts reduces soil surface resistance to erosion, increasing soil loss and sediment transport in these areas from wind and water erosion.

Surface-disturbing activities that compact the soil would increase in bulk density and would reduce porosity, infiltration, moisture, air, nutrient cycling, productivity, and biotic activity (Perrow and Davy 2003; Bainbridge 2007). Changes in species composition of the biological soil crusts{ XE "Biological Soil Crust" } may result from compaction, due to its influence on soil water and nutrient holding capacity (Eldridge 1996, as cited in US DOI 2001). Altering such characteristics could reduce the soil system's ability to adapt to climate change and to withstand future disturbances. Because such soils are composed of many types of organisms, the assemblage can change if disturbed. (US DOI 2001; Ferrenberg et al. 2015).

In addition, pH is an important factor for nutrient availability. Higher pH soils, combined with lower moisture, tend to support high numbers of bacteria in the biological crusts. Biological crusts are important in these areas, because grasses tend to be sparse between the shrubs, and well developed biological crust communities add to soil stability in these areas.

Authorized Uses

Management actions that affect the density of livestock use, such as the stocking rate{ XE "Stocking Rate" }, structural range improvements{ XE "Range Improvement" } (e.g., corrals and fences), and the distribution of water developments, can affect the intensity of impacts on soils in certain areas. Fencing can be used to confine livestock to or exclude livestock from an area. When fencing is used to confine livestock, impacts are limited to the enclosed areas and impacts are reduced outside of the area. When fencing is used to exclude, impacts are limited to areas

outside of the exclosure. These techniques can be used to reduce impacts on highly susceptible soils or on biological soil crusts{ XE "Biological Soil Crust" }.

The timing and duration of livestock use also affects the intensity of impacts. Livestock grazing modification after seeding{ XE "Seeding" } or wildfires can prevent additional impacts on soils during these periods and can allow for revegetation and soil health improvement. Implementing season of use for certain areas may also reduce impacts during periods when soils may be more highly erodible.

The BLM uses land health evaluations, rangeland monitoring studies, and BLM Utah Land Health Standards to assess rangeland conditions and to identify where a change in livestock grazing management would be beneficial. In general, the more acres that are open to grazing under a given alternative, the greater the risk for negative impacts. On NPS-managed lands, additional criteria beyond BLM Utah Rangeland Health{ XE "Rangeland Health" } Standards may be required as specified in the 1999 GzMP{ XE "Grazing Management Plan, Glen Canyon (GzMP 1999)" } and other NPS policies.

4.5.4 Direct and Indirect Impacts

The analysis area for soil is the same as the decision area for the MMP{ XE "Monument Management Plan, Grand Staircase-Escalante National Monument (MMP 2000)" }-A.

Impacts Common to Alternatives A, C, D, and E

While maximum permitted AUMs vary across alternatives, the density of average actual use AUMs only varies slightly, between 49 and 52 acres available per AUM. There are 52 acres available per AUM under Alternative E, 51 acres available per AUM for Alternative A, 50 acres available per AUM for Alternative D, and 49 acres available per AUM for Alternative C. The impacts on soil from livestock are described under *Nature and Type of Impacts*, above.

The primary concerns are that livestock grazing leads to soil compaction and erosion and reduced infiltration rates. Decreasing grazing intensity will reduce or reverse these impacts. Grazing can be decreased by removing all or a portion of cattle from an allotment for a season or longer. In addition to decreased use, impacts can be minimized by implementing grazing systems, such as rest-rotation and grazing outside of the time when forage is most susceptible to damage (usually spring{ XE "Spring" }). Herding on a somewhat daily basis to prevent overuse in certain areas can minimize impacts. Also, setting minimum stubble heights can minimize impacts. Finally, monitoring and adaptive management are critical to identifying impacts from livestock grazing and associated activities and developing appropriate corrective measures.

Alternative A

There would continue to be 2,089,000 acres (93 percent of the decision area) available for livestock grazing. Livestock would continue to graze at existing permitted levels (76,957 active AUMs of a maximum permitted 106,202 AUMs). Average actual use would continue to be approximately 41,343 AUMs. Impacts on soil from livestock would continue, as described under *Nature and Type of Impacts*. There would continue to be no impacts on soil from livestock in areas unavailable to livestock grazing, which covers 153,000 acres, or 7 percent of the decision area.

There are 1,276,000 acres (57 percent of the decision area) where livestock grazing (available for grazing, reserve common allotments{ XE "Reserve Common Allotment" }, and trailing) would continue to occur on sensitive soils. There are 73,800 acres (3 percent of the decision area) that would continue to be unalloted or unavailable for livestock grazing on sensitive soils (BLM GIS 2014). Potential early biological crust and late biological crust aggregate covers the entire decision area. Impacts on soil would continue as described under *Nature and Type of Impacts.*

Impacts on soil from structural and nonstructural range improvements{ XE "Range Improvement" } would continue under current management. For example, in GSENM, the BLM would maintain or restore ranges with native and nonnative species. Range improvements would continue to maintain or restore soil conditions, because native vegetation would stabilize soil conditions, thereby minimizing the erosion of soil. Nonstructural range improvements and land treatments are not appropriate in Glen Canyon. Impacts on soil would continue, as described under *Nature and Type of Impacts.*

There are six livestock grazing allotments in the decision area that do not meet Standard 1, and livestock grazing was determined to be the cause on all six allotments: Circle Cliffs, Coyote, Mollies Nipple, Soda, Upper Paria, and Vermilion. In these allotments, 379,400 acres (17 percent of the decision area) would continue to be available for livestock grazing, and 16,800 acres (0.7 percent of the decision area) would continue to be unalloted (BLM GIS 2014). Impacts on soil would continue, as described under *Nature and Type of Impacts*.

Since 2006, the BLM, in coordination with permittees, has made changes in the six allotments. Such changes include seeding{ XE "Seeding" } restoration, restricting season of use, maintaining range improvements{ XE "Range Improvement" }, implementing voluntary nonuse, and removing feral cattle. As a result of these changes, many areas that previously did not meet standards are now making progress toward meeting standards based on recent assessments. This trend would continue under Alternative A.

Alternative B

There would be no livestock grazing under Alternative B; consequently, there would be no impacts on soil from livestock (including sensitive soils, early biological crust, and late biological crust aggregate). Compared with Alternative A, there would be none of the impacts on soil from livestock that are described under *Nature and Type of Impacts.*

Impacts on soil from structural and nonstructural range improvements{ XE "Range Improvement" } would still occur from proposed management under Alternative B. For example, in GSENM, the BLM would restore ranges with native species. In GSENM and Glen Canyon, structural range improvements may be removed. This would restore the natural conditions of the ranges, allowing natural soil conditions to develop over larger areas. Impacts on soil from structural and nonstructural range improvements would occur as described under *Nature and Type of Impacts*. Compared with Alternative A, Alternative B would maintain or restore soil conditions over a larger area.

There are six livestock grazing allotments in the decision area that do not meet Standard 1, and livestock grazing was determined to be the cause on all six allotments: Circle Cliffs, Coyote,

Mollies Nipple, Soda, Upper Paria, and Vermilion. Impacts on soil would occur as described under *Nature and Type of Impacts*. Because livestock grazing would not occur, these six allotments have a higher potential for meeting Standard 1 more quickly under Alternative B than under Alternative A.

Since 2006, the BLM, in coordination with permittees, has made changes in the six allotments. Such changes include seeding{ XE "Seeding" } restoration, restricting season of use, maintaining range improvements{ XE "Range Improvement" }, implementing voluntary nonuse, and removing feral cattle. As a result of these changes, many areas that did not meet standards are now making progress toward doing so, based on recent upland assessments. Compared with Alternative A, this trend would increase under Alternative B, because there would be no grazing to affect the allotments that do not meet Standard 1. However, the BLM would not have permittees with which to partner under this alternative.

Alternative C

There would be 1,619,700 acres (72 percent of the decision area) available for livestock grazing. There would be 63,144 active AUMs, with projected average actual use being 33,368 AUMs. There would be 469,300 fewer acres (21 percent of the decision area) available for livestock grazing than under Alternative A. There would be 13,813 fewer active AUMs. However, the projected average actual use would be 7,975 fewer AUMs. Impacts on soil from livestock would continue, as described under *Nature and Type of Impacts*. Compared with Alternative A, the area where livestock activities would occur would decrease by 23 percent of the decision area. This would result in fewer impacts on soil, because less area would be grazed.

There would be 622,300 acres (28 percent of the decision area) unavailable for livestock grazing. The impacts on soil from livestock described under *Nature and Type of Impacts* would not occur in this area. Compared with Alternative A, there would be an increase of 469,300 acres (21 percent of the decision area) where livestock grazing would be unavailable. This would result in fewer impacts on soil from livestock grazing under Alternative C.

There are 1,010,300 acres (45 percent of the decision area) where livestock grazing and trailing would occur on sensitive soils. There are 339,500 acres (15 percent of the decision area) that would be unavailable for livestock grazing on sensitive soils (BLM GIS 2014). Potential early biological crust and late biological crust aggregate covers the entire decision area.

Impacts on soil would continue as described under *Nature and Type of Impacts*. Compared with Alternative A, the area where livestock activities would occur on sensitive soils would decrease by 12 percent of the decision area, thereby providing more protection to sensitive soils. Compared with Alternative A, the area where livestock would graze that is on potential early biological crust and late biological crust aggregate would decrease by 21 percent of the decision area. This would provide more protection for these soil types.

Impacts on soil from structural and nonstructural range improvements{ XE "Range Improvement" } would occur from proposed management under Alternative C. For example, in GSENM, the BLM would maintain or restore ranges with native species. Passive restoration and non-chemical methods would be the priority for preventing the introduction, establishment, and spread of noxious weeds{ XE "Noxious Weed" } and nonnative invasive species{ XE "Invasive

Species" }. Livestock grazing after native seeding{ XE "Seeding" } restoration would be modified to ensure the survival of the native plants. Impacts on soil from structural and nonstructural range improvements would occur as described under *Nature and Type of Impacts*.

Compared with Alternative A, livestock grazing would be managed or discontinued to reduce conflicts with resources, including soil resources. Changes in grazing systems, such as season of use, intensity, and rotation, would be considered before implementing range improvements{ XE "Range Improvement" }. This would minimize impacts on soil, such as during critical times of the year.

There are six livestock grazing allotments in the decision area that do not meet Standard 1. Livestock grazing was determined to be the cause on all six allotments: Circle Cliffs, Coyote, Mollies Nipple, Soda, Upper Paria, and Vermilion. Impacts on soil would occur as described under *Nature and Type of Impacts*.

The following areas would be unavailable for livestock grazing: Circle Cliffs (Gulch and Lampstand pastures), Mollie's Nipple (portion of Buckskin pasture, Blue Springs{ XE "Spring" }, and Jenny Clay Hole pastures), Upper Paria (Henderson Canyon, Lower Coal Bench, South, Upper Coal Bench, and Willis Creek pastures), and Vermilion (Seaman pasture). This would remove the cause of not meeting Standard 1. These portions of allotments cover 67,000 acres (3 percent of the decision area). The remaining livestock grazing allotment areas in the decision area that do not meet Standard 1 cover 329,300 acres, or 15 percent of the decision area (BLM GIS 2014). If a land health determination finds that an allotment is not meeting objectives and BLM Utah Rangeland Health{ XE "Rangeland Health" } Standards, and if livestock grazing is contributing or is a factor, then grazing would be temporarily suspended{ XE "Suspension" }. Because livestock grazing would not occur in some allotments, these six areas have a higher potential for meeting Standard 1 more quickly under Alternative C than under Alternative A.

Since 2006, the BLM, in coordination with permittees, has made the following changes in the six allotments: seeding{ XE "Seeding" } restoration, restricting season of use, maintaining range improvements{ XE "Range Improvement" }, implementing voluntary nonuse, and removing feral cattle. As a result of these changes, many areas that did not meet standards are now making progress toward doing so, based on recent upland assessments. Compared with Alternative A, this trend has the potential to increase under Alternative C, because grazing would decrease in the allotments that do not meet Standard 1. However, the BLM would not have permittees with which to partner in allotment that are unavailable for livestock grazing.

Alternative D

There would be 2,135,200 acres (95 percent of the decision area) available for livestock grazing under Alternative D. There would be 107,955 active AUMs (30,998 more active AUMs than Alternative A, a 40 percent increase). However, the projected average actual use would be 42,885 AUMs (a 4 percent increase). There would be 46,200 more acres (2 percent of the decision area) available for livestock grazing. Impacts on soil from livestock would continue as described under *Nature and Type of Impacts*.

Although Alternative D would emphasize structural and nonstructural range improvements{ XE "Range Improvement" }, with the goal of better livestock distribution, the pattern of livestock

use is still likely to be similar to current distribution, because of other constraints. For example, approximately 40 percent of GSENM is WSAs, where new or expanded treatments would not be allowed. In these areas, livestock grazing use patterns would persist; therefore, because more livestock would be on the landscape, the likelihood is increased that grazing would impact soils. This would make it increasingly difficult to meet the BLM Utah's Rangeland Health{ XE "Rangeland Health" } Standards compared with Alternative A.

There would be 106,800 acres (5 percent of the decision area) unavailable for livestock grazing. The impacts on soil from livestock, described under *Nature and Type of Impacts*, would not occur in this area. Compared with Alternative A, there would be a decrease of 46,200 acres (2 percent of the decision area) where livestock grazing would be unavailable; in other words, there would be more acres where livestock grazing would be available. This would result in more opportunities for impacts on soil from livestock grazing under Alternative D.

There are 1,319,600 acres (59 percent of the decision area) that would be available for livestock grazing on sensitive soils. There are 30,200 acres (1 percent of the decision area) that would be unavailable for livestock grazing on sensitive soils (BLM GIS 2014). Potential early biological crust and late biological crust aggregate covers the entire decision area. Impacts on soil would occur as described under *Nature and Type of Impacts*. Compared with Alternative A, the area where livestock activities would occur on sensitive soils would increase by 2 percent of the decision area, thereby increasing impacts on sensitive soils. Compared with Alternative A, the area where livestock would graze on potential early biological crust and late biological crust aggregate would increase by 2 percent of the decision area. This would provide less protection for these soil types.

Impacts on soil from structural and nonstructural range improvements{ XE "Range Improvement" } would occur from proposed management under Alternative D. For example, in GSENM, the BLM would maintain or restore ranges with native and nonnative species; it would allow new seedings{ XE "Seeding" }, using native and nonnative plants, and would allow a variety of vegetation restoration methods. The BLM would maintain structural range improvements so that forage reserves would be ready for use when needed. In GSENM and Glen Canyon, the BLM and NPS would adaptively manage the season-of-use, duration, distribution, and stocking rate{ XE "Stocking Rate" }. Impacts on soil would occur as described under *Nature and Type of Impacts*.

Livestock management would promote improving land health, which involves soil resources. This would include developing and maintaining nonstructural range improvements{ XE "Range Improvement" }. It would also promote maintenance of range improvements, including water development, fence repairs, fence installation, the use of machinery, and vehicle access for range improvements. Impacts on soil from structural and nonstructural range improvements would occur as described under *Nature and Type of Impacts*. In order to provide for the optimum level of livestock grazing and the attainment of healthy rangelands, Alternative D contains more structural and nonstructural range improvements than Alternative A. Depending on the type of improvement, soil may be more easily eroded or maintained, as described under *Nature and Type of Impacts*.

There are six livestock grazing allotments in the decision area that do not meet Standard 1, and livestock grazing was determined to be the cause on all six allotments: Circle Cliffs, Coyote, Mollies Nipple, Soda, Upper Paria, and Vermilion. Impacts on soil would occur as described under *Nature and Type of Impacts*. In these allotments, 396,200 acres (18 percent of the decision area) would continue to be available for livestock grazing (BLM GIS 2014). The impacts on soil would be similar to those under Alternative A, except for the additional 16,800 acres in Upper Paria that would be available under Alternative D for livestock grazing.

Since 2006, the BLM, in coordination with permittees, made changes in the six allotments: seeding{ XE "Seeding" } for restoration, restricting season of use, maintaining range improvements{ XE "Range Improvement" }, implementing voluntary nonuse, and removing feral cattle. As a result of these changes, many areas that did not meet standards are now making progress toward doing so, based on recent upland assessments. Compared with Alternative A, this trend has the potential to decrease under Alternative D, because grazing would increase in the allotment (Upper Paria) that does not meet Standard 1.

Alternative E

There would be 2,065,300 acres (92 percent of the decision area) available for livestock grazing. There would be 76,520 active AUMs, with projected average actual use being 40,100 AUMs. There would be 23,700 fewer acres (1 percent of the decision area) available for livestock grazing. There would be 437 fewer active AUMs. However, the average actual use would be 1,243 fewer AUMs. Impacts on soil from livestock would continue as described under *Nature and Type of Impacts*. Compared with Alternative A, there would be slightly fewer impacts on soil, because slightly less area would be grazed. The intensity of impacts would be about the same as under Alternative A.

There would be 176,700 acres (8 percent of the decision area) unavailable for livestock grazing. The impacts on soil from livestock described under *Nature and Type of Impacts* would not occur in this area. Compared with Alternative A, there would be an increase of 23,700 acres (1 percent of the decision area) where livestock grazing would be unavailable, resulting in fewer impacts on soil from livestock grazing under Alternative E.

There are 1,273,700 acres (57 percent of the decision area) where livestock grazing activities (available for grazing, reserve common allotments{ XE "Reserve Common Allotment" }, and trailing) would occur on sensitive soils. There are 76,100 acres (3 percent of the decision area) that would be unavailable for livestock grazing on sensitive soils (BLM GIS 2014). Potential early biological crust and late biological crust aggregate covers the entire decision area. covers the entire decision area.

Impacts on soil would continue as described under *Nature and Type of Impacts*. The impacts on sensitive soils would be similar to those under Alternative A, except grazing would not occur on an additional 23,700 acres under Alternative E. Compared with Alternative A, the area where livestock would graze on potential early biological crust and late biological crust aggregate would decrease by 1 percent of the decision area. This would provide more protection for these soil types.

Impacts on soil from structural and nonstructural range improvements{ XE "Range Improvement" } would occur from proposed management under Alternative E. For example, in GSENM, the BLM would maintain or restore ranges with native and nonnative species and would allow a variety of vegetation restoration methods. The BLM would authorize structural range improvements consistent with the MMP{ XE "Monument Management Plan, Grand Staircase-Escalante National Monument (MMP 2000)" }. Also in GSENM, the BLM would adaptively manage season of use, duration, distribution, and stocking rate{ XE "Stocking Rate" }. The BLM would emphasize sustainable yield through livestock management design. This would be done to ensure BLM Utah Rangeland Health{ XE "Rangeland Health" } Standards are achieved and land health, including soil resources, is improved.

Additionally, nonstructural range improvements{ XE "Range Improvement" } would be managed both for ecosystem processes and forage production. Impacts on soil from structural and nonstructural range improvements would occur as described under *Nature and Type of Impacts*. Compared with Alternative A, Alternative E emphasizes multiple use and sustained yield through grazing management. It is designed to ensure that BLM Utah Rangeland Health{ XE "Rangeland Health" } Standards are achieved and that land health is improved.

There are six livestock grazing allotments in the decision area that do not meet Standard 1, and livestock grazing was determined to be the cause on all six: Circle Cliffs, Coyote, Mollies Nipple, Soda, Upper Paria, and Vermilion. Impacts on soil would occur as described under *Nature and Type of Impacts*. The impacts would be the same as those under Alternative D.

Since 2006, the BLM, in coordination with permittees, has made changes in the six allotments. Such changes include seeding{ XE "Seeding" } restoration, restricting season of use, maintaining range improvements{ XE "Range Improvement" }, implementing voluntary nonuse, and removing feral cattle. As a result of these changes, many areas that did not meet standards are now making progress toward doing so, based on recent upland assessments. The trend under this alternative would be the same as under Alternative D.

4.5.5 Cumulative Impacts

The cumulative impacts analysis area for soil resources is the planning area.

There are past, present, and reasonably foreseeable future actions (see **Table 4-1**) and conditions within the cumulative impacts analysis area, both on public and private land, that have affected and will likely continue to affect soil. These actions are livestock grazing, vegetation management, recreation and visitor use, lands and realty, spread of noxious and invasive weeds, wildfires, and drought. In general, livestock grazing, recreation and visitor use, and lands and realty involve activities that disturb the ground surface, thereby allowing for the erosion of soil by wind and water. They also diminish soil productivity, thereby inhibiting the establishment and productivity of plants that hold the soil in place. *Nature and Type of Impacts*, above, contains additional details on how livestock grazing affects soil.

Vegetation management for greater sage-grouse{ XE "Greater Sage-Grouse" }, vegetation treatments{ XE "Vegetation Treatment" }, and invasive vegetation management is conducted in the planning area. This includes managing the spread of noxious and invasive weeds through the

Programmatic Noxious Weed and Invasive Plant Management Plan. Establishing and maintaining appropriate vegetation to hold soil in place reduces soil erosion by water and wind.

The application of prescribed fire can improve soil health where vegetation relies on fire to propagate. Prescribed fire can spread the seeds of certain vegetation, improving vegetation cover and soil stability in the long term. However, in the short term, prescribed fires also leave the ground surface bare and, therefore, more susceptible to erosion by wind and water.

For much of the last decade, most of the western United States has experienced drought. Precipitation is expected to decline throughout much of the year from 2015 to 2030, with the exception of a couple of months in the fall; severe droughts are likely in some areas. As vegetation is stressed or lost due to insufficient water, soil becomes more susceptible to erosion by wind and water.

There are six livestock grazing allotments in the decision area that do not meet Standard 1, and livestock grazing was determined to be the cause in all six: Circle Cliffs, Coyote, Mollies Nipple, Soda, Upper Paria, and Vermilion. Since 2006, the BLM, in coordination with permittees, has made changes in those allotments. Such changes include seeding**{** XE "Seeding" **}** restoration, restricting season of use, maintaining range improvements**{** XE "Range Improvement" **}**, implementing voluntary nonuse, and removing feral cattle. As a result of these changes, many areas that did not meet standards are now making progress toward doing so, based on recent upland assessments. This trend is expected to continue and would add to other livestock grazing management actions that promote soil health in order to meet BLM Utah Rangeland Health**{** XE "Rangeland Health" **}** Standard 1.

The MMP**{** XE "Monument Management Plan, Grand Staircase-Escalante National Monument (MMP 2000)" **}**-A alternatives rely on BLM Utah Rangeland Health**{** XE "Rangeland Health" **}** Standards. Under the alternatives, the BLM and NPS would work toward achieving the standards in GSENM and Glen Canyon. When MMP-A alternatives are added to past, present, and reasonably foreseeable future actions (described in **Table 4-1**), the alternatives would have cumulative impacts on soil. The alternatives would differ in the time and methods used to meet the standards through the following:

- Changes in acres available for livestock grazing
- Changes in acres available for livestock grazing with sensitive soils or biological soil crust**{** XE "Biological Soil Crust" **}** cover
- Changes in AUMs allocated for livestock
- Changes in density of AUMs for livestock (acres available per AUM)
- Allowance for or restrictions on building or maintaining new structural and nonstructural range improvements**{** XE "Range Improvement" **}**

Among the alternatives, Alternative B would have the greatest likelihood of reducing potential impacts on soil resource factors for analysis due to the removal of livestock from the decision area. Alternative D would have the greatest likelihood of increasing potential impacts due to its allowance for greater available acreage for grazing and increased AUMs within the decision area.

4.5.6 References

Bainbridge, D. A. 2007. *A Guide for Desert and Dryland Restoration: New Hope for Arid Lands*. Island Press, Washington, DC.

Belnap, J., and D. Eldridge. 2001. "Disturbance and Recovery of Biological Soil Crusts." In *Ecological Studies, Vol. 150, Biological Soil Crusts: Structure, Function, and Management* (Dr. Jayne Belnap and Dr. Otto L. Lange, editors). Springer-Verlag, Berlin and Heidelberg, Germany. Pp. 363-383.

BLM GIS. 2014. Base GIS data on file with the BLM's eGIS server used for calculations or figures to support the MMP{ XE "Monument Management Plan, Grand Staircase-Escalante National Monument (MMP 2000)" }-A. BLM, Grand Staircase Escalante National Monument, Utah.

Bowker, M. A., J. Belnap, V. Bala Chaudhary, and N. C. Johnson. 2008. "Revisiting classic water erosion models in drylands: The strong impact of biological soil crusts{ XE "Biological Soil Crust" }." *Soil Biology and Biochemistry* 40:2309-2316. doi: 10.1016/j.soilbio.2008.05.008.

Ferrenberg, S., S. C. Reed, and J. Belnap. 2015. "Climate change{ XE "Climate Change" } and physical disturbance cause similar community shifts in biological soil crusts{ XE "Biological Soil Crust" }." PNAS 112(39).

Grzesiak, M. T. 2009. "Impact of soil compaction on root architecture, leaf water status, gas exchange and growth of maize and triticale seedlings." Root Plant 3: 10-16. doi:10.3117/plantroot.3.10. The Franciszek Gorski Institute of Plan Physiology, Krakow, Poland.

Manier, D. J., D. J. A. Wood, Z. H. Bowen, R. M. Donovan, M. J. Holloran, L. M. Juliusson, K. S. Mayne, et al. 2013. Summary of Science, Activities, Programs, and Policies that Influence the Rangewide Conservation of Greater Sage-Grouse{ XE "Greater Sage-Grouse" } (*Centrocercus urophasianus*). US Geological Survey Open-File Report 2013–1098. Internet website: http://pubs.usgs.gov/ of/2013/1098/.

Memmott K. L., V. J. Anderson, and S. B. Monsen. 1998. "Seasonal grazing impact on cryptogamic crusts in a cold desert ecosystem." Journal of Range Management 51:547-550. 1998.

Miller, M. E. "Broad-scale assessment of rangeland health{ XE "Rangeland Health" }, Grand Staircase-Escalante National Monument, USA." Rangeland Ecology and Management 61:249-262.

Monsen S. B., R. Stevens, and N. L. Shaw. 2004. Restoring Western Ranges and Wildlands (General Technical Report RMRS-GTR-136, Volume 1). Forest Service, Rocky Mountain Research Station. Fort Collins, Colorado. Internet website: http://www.fs.fed.us/rm/pubs /rmrs_gtr136_1.pdf.

Perrow, M. R., and A. J. Davy (editors). 2003. *Handbook of Ecological Restoration: Vol. 1 Principles of Restoration.* Cambridge University Press, New York, New York.

Roberson, Emily. 1996. Impacts of Livestock Grazing on Soils and Recommendations for Management. California Native Plant Society Senior Land Management Analyst. November 20, 1996.

Smith, L. Undated. 5-6 County Desired Future Rangeland Conditions and Range Management Guidelines – Biological Soil Crusts Section. Cascabel Ranch and Consulting. Unpublished report on file with BLM GSENM (received January 18, 2017).

US DOI (Department of the Interior). 2001. US DOI Bureau of Land Management and US Geological Survey, 2001. Technical Reference 1730-2, 2001, Biological Soil Crusts: Ecology and Management.

4.6 Water Resources

This section discusses impacts on water resources from proposed management actions. Existing conditions are described in **Section 3.4**, Water Resources. Impacts on water resources are similar to impacts on soil resources, because impacts on soil resources often result in corresponding or subsequent impacts on water resources. For example, surface disturbances that result in soil erosion can subsequently affect sedimentation and turbidity in water resources.

4.6.1 Methods of Analysis

Impacts were determined by assessing which actions, if any, would change the quality, quantity, or physical characteristics of water resources. Some impacts are direct, while others are indirect and affect water resources through a change in another resource. Direct impacts on water resources are, for example, those from contamination of streams or depletion of aquifers. Indirect impacts are those that occur later in time or farther removed in distance, such as soil erosion that increases the potential for sedimentation into streams.

In addition to the assumptions in **Section 4.1.1**, the analysis assumes the following:

- Water resources will be managed to meet BLM Utah Rangeland Health**{** XE "Rangeland Health" **}** Standards and Guidelines for Grazing Management. On NPS-managed lands, additional criteria beyond BLM Utah Rangeland Health Standards may be required as specified in the 1999 GzMP**{** XE "Grazing Management Plan, Glen Canyon (GzMP 1999)" **}** and other NPS policies.
- The degree of impact attributed to any one disturbance or series of disturbances will be influenced by several factors, including proximity to drainages and existing groundwater wells, location in the watershed, time and degree of disturbance, reclamation potential of the affected area, existing vegetation, precipitation, and mitigating actions applied to the disturbance.
- Aquifers with shallower depths to water are more susceptible to contamination. Locations in the planning area with depths to groundwater of less than 100 feet or unconfined aquifers are considered the most likely to be impacted. Unconfined

aquifers or aquifers with water table elevations of 100 feet below ground surface are more vulnerable to contaminants at the surface.

- Projects that help restore watersheds, desirable vegetation communities, or wildlife habitats (including surface disturbance associated with these activities) would improve water resources over the long term.
- Livestock grazing management is not anticipated to impact water availability.

4.6.2 Factors for Analysis

Factors for analysis of impacts on water resources are the following:

- Potential for meeting BLM Utah's Rangeland Health{ XE "Rangeland Health" } Standards, as affected by
  - Changes in acres available for livestock grazing
  - Changes in density of AUMs for livestock (acres available per AUM)
  - Allowance for or restrictions on the construction or maintenance of structural and nonstructural range improvements{ XE "Range Improvement" }
- Miles of 303(d)-listed streams available for or adjacent to areas available for livestock grazing, as affected by
  - Changes in acres available for livestock grazing
  - Changes in density of AUMs for livestock (acres available per AUM)
  - Allowance for or restrictions on the construction or maintenance of structural and nonstructural range improvements{ XE "Range Improvement" }

4.6.3 Nature and Type of Impacts

The mandate to manage land for multiple uses requires the BLM to consider land uses that could degrade water quality, destabilize natural stream morphologic conditions, impair sustainability of water resources (water quantity), alter groundwater aquifer properties, and modify natural stream hydrographs. Minimizing such impacts is a theme common to all of the alternatives. However, impacts associated with livestock grazing management may still occur and include erosion and sedimentation into streams and contamination of water resources.

Sedimentation

Surface-disturbing activities, trampling, grazing, or structural range improvements{ XE "Range Improvement" }, such as fences, cattle guards, corrals, cabins, or water developments, can remove essential soil-stabilizing agents. Examples of these agents are vegetation, soil crusts, litter, and woody debris. These soil features function as living mulch by retaining soil moisture and discouraging annual weed growth (Belnap et al. 2001). Loss of one or more of these agents increases potential erosion and resulting sediment transport to water bodies, leading to increased turbidity and water quality degradation. The impacts can be short term or long term, depending on the type, frequency, and intensity of disturbance, the area disturbed, and the time it takes for soil-stabilizing agents to become reestablished.

Sedimentation can impact water quality and the physical characteristics of streams, resulting in habitat alteration or loss, stress, and reduced recruitment, particularly for sediment-intolerant species (Behnke 1979). In addition, reducing vegetation cover may lead to higher water temperatures (Marlow and Pogacnik 1985). This could further impact the physical characteristics of streams, potentially to an extent that they are no longer sustainable or functioning properly. The impacts of disturbances are determined in large part by their intensity, duration, frequency, timing, and by the extent of the area affected.

Mechanical alteration associated with surface-disturbing activities, such as structural range improvements**{** XE "Range Improvement" **}** and increased sedimentation from impaired watersheds, can also increase width and depth ratios in stream channels. This can increase lateral stream bank erosion and further sedimentation to streams (Rosgen 1996). For example, some studies show that livestock trampling can have significant impacts on channel morphology and functional condition, especially for small low-gradient streams with banks composed of fine-grained soils (Platts 1991; Clary et al. 1996).

Surface-disturbing activities carry more erosion risks in areas of low reclamation potential and sensitive areas, such as stream channels, floodplains, and riparian habitats. Examples of low reclamation potential are soils with severe wind erosion susceptibility, severe or very severe water erosion susceptibility, or soils on rock outcrops. Disturbance in all of these areas creates greater potential for erosion and sediment delivery to surface waters, degrading water quality.

Biological soil crusts**{** XE "Biological Soil Crust" **}** have been shown to be a key component in soil stability and in the reduction of water erosion in some soils (Bowker et. al 2008). Biological soil crusts can increase the resistance of the soil surface to erosion and reduce sediment yield, reducing the potential for sedimentation into waterways and increasing the stability of banks. Surface-disturbing activities that destroy or damage biological soil crusts reduce the soils' resistance to erosion and sedimentation. As described in **Section 4.5.3**, the recovery rate of biological soil crusts depends on a number of factors; however, they are generally considered long term impacts, because biological soil crusts can take 50 to 100 years to recover, but may be shorter.

Surface-disturbing activities in stream channels, floodplains, and riparian habitats are more likely to alter natural stability and floodplain function. Destabilization and loss of floodplain function accelerate stream channel and bank erosion, increase sediment supply, dewater near-stream deposits, and cause fish and riparian habitat loss and water quality deterioration (Rosgen 1996). Altering or removing riparian habitats can reduce the hydraulic roughness of the bank and increase flow velocities near the bank (National Research Council 2002). Increased flow velocities can accelerate erosion, thereby decreasing water quality.

Surface-disturbing activities that repeatedly disturb or impact the soil, such as the congregation of livestock around surface water for water and shade or by water developments, can compact soil, which decreases infiltration rates and elevates the potential for increased overland flow. This higher flow velocity can increase erosion and sediment delivery potential to area water bodies, leading to water quality degradation. The impacts can be short term or long term, depending on the type, frequency, and intensity of disturbance, and area disturbed.

Certain surface-disturbing activities, such as structural range improvements{ XE "Range Improvement" }, can remove vegetation completely. Other activities, such as prescribed fires or livestock grazing, may reduce the health and vigor of vegetation. The loss of vegetation can increase soil instability because plants no longer hold soil in place. This would result in sediment transport to surface water bodies, leading to water quality degradation. The impacts can be short term or long term, depending on the type, frequency, and intensity of disturbance, the area disturbed, and the time it takes for plant communities to become reestablished.

Removing vegetation can also increase overland flow because plants would no longer be present to absorb water. This would result in more water entering streams and fens and could influence water quality. Impacts from vegetation removal may be short term or long term, depending on the degree and location of vegetation removal. Management actions to promote species diversity, restore vegetation to damaged areas, and limit surface-disturbing activities on vegetation generally reduce impacts on water resources. Removing vegetation can also increase overland flow because plants would no longer be present to absorb water. This would result in more runoff capable of influencing water quality.

Impacts from vegetation removal may be short term or long term, depending on the degree and location of vegetation removal. Management actions to promote species diversity, restore vegetation to damaged areas, and limit surface-disturbing activities on vegetation generally reduce impacts on water resources. The impacts can be short term or long term, depending on the type, frequency, and intensity of disturbance, the area disturbed, and the time it takes for plant communities to become reestablished.

Long-term impacts of nonstructural range improvements{ XE "Range Improvement" } such as chemical, mechanical, and prescribed fire treatments, are expected to improve vegetation conditions; even so, prescribed fire can have variable short-term impacts. These may include increased erosion, sedimentation, and nutrient loading in surface water systems, especially if burn severity is greater than expected. Furthermore, depending on the soils, topography, and recovery time between burns and precipitation, it can increase runoff rates and peak flows, even though evapotranspiration is reduced. The impacts can be short term or long term, depending on the frequency and intensity of disturbance, the area disturbed, and the time it takes for plant communities to become reestablished.

Contamination

Livestock grazing increases the presence of waste matter and bacteria on the soil surface. These materials can contaminate surface water directly if deposited into a water body, leading to nutrient loading and diminished water quality. These materials may also be washed into surface water through overland flow or may percolate into groundwater during recharge, indirectly impacting water quality. These impacts can be short term or long term, depending on season of use, type of use, intensity of livestock grazing or use, and climatic conditions.

Water developments, such as wells, may impact water quality if they are not properly maintained. The transport of nutrients, bacteria, chemicals, or other waste products into wells can impact groundwater quality, especially in areas where the depth to groundwater is less than 100 feet or where there are unconfined aquifers.

Livestock grazing management can include the use of herbicides to control weeds, which can contaminate surface water and groundwater. GSENM manages weed infestations through the Programmatic Noxious Weed and Invasive Plant Management Plan.

Authorized Uses

Management that affects the location of livestock congregation, such as water developments and structural range improvements{ XE "Range Improvement" }, can affect the intensity of impacts on water resources. Livestock congregating near streams, springs{ XE "Spring" }, seeps, fens, or riparian and wetland{ XE "Wetland" } areas can increase the opportunity for direct impacts on water resources from sedimentation and contamination. Livestock in areas with highly susceptible soils can increase the risk of sediment transport into waterways.

Management that determines the timing and duration of livestock use also affects the intensity of impacts. Livestock grazing modification after wildfires can prevent additional impacts on water resources and allow for revegetation and bank stability improvements.

4.6.4 Direct and Indirect Impacts

The analysis area for water resources is the same as the decision area.

Impacts Common to Alternatives A, C, D, and E

While maximum permitted AUMs vary across alternatives, the density of average actual use AUMs only varies slightly, between 49 and 52 acres available per AUM. There are 52 acres available per AUM under Alternative E, 51 acres available per AUM for Alternative A, 50 acres available per AUM for Alternative D, and 49 acres available per AUM for Alternative C. The impacts on water from livestock are described under *Nature and Type of Impacts*.

The primary concerns are that livestock grazing leads to soil compaction and erosion and reduced infiltration rates. Decreasing grazing intensity will reduce or reverse these impacts when they occur. Grazing can be decreased by removing all or a portion of cattle from an allotment for a season or longer.

In addition to decreased use, impacts can be minimized by implementing grazing systems, such as rest-rotation and grazing outside of the time when forage is most susceptible to damage (usually spring{ XE "Spring" }). Herding on a somewhat daily basis to prevent overuse in certain areas can minimize impacts. Also, setting minimum stubble heights can minimize impacts. Finally, monitoring and adaptive management are critical to identifying impacts from livestock grazing and associated activities and developing appropriate corrective measures.

Alternative A

There would continue to be 2,089,000 acres (93 percent of the decision area) available for livestock grazing. Livestock would continue to graze at existing permitted levels (76,957 active AUMs of a maximum permitted 106,202 AUMs). However, the average actual use would continue to be approximately 41,343 AUMs. Impacts on water from livestock would continue, as described under *Nature and Type of Impacts*. There would continue to be no impacts on water from livestock in areas unavailable for livestock grazing, which covers 153,000 acres (7 percent of the decision area).

Impacts on water from structural and nonstructural range improvements{ XE "Range Improvement" } would continue from current management under Alternative A. For example, in GSENM, the BLM would continue to use water developments as a management tool. Nonstructural range improvements and land treatments are not appropriate in Glen Canyon. In Glen Canyon, all water developments must consider the needs of wildlife and recreation. Impacts on water would continue, as described under *Nature and Type of Impacts*.

Livestock grazing would continue to be available on allotments containing 92.6 miles of 303(d)-listed streams. There would continue to be 38.2 miles of 303(d)-listed streams on lands unalloted or unavailable for livestock grazing. All 303(d)-listed streams are perennial{ XE "Perennial" } (BLM GIS 2014). Impacts on water would continue, as described under *Nature and Type of Impacts*.

Livestock grazing allotments in the decision area that do not meet Standard 4, due to livestock grazing, are Rock Creek-Mudholes and Vermilion. Grazing was a contributing factor{ XE "Contributing Factor" }, but not the sole causal factor{ XE "Causal Factor" }, for Standard 4 not being met in the Headwaters, Last Chance, and Nipple Bench allotments. Within these allotments, there would continue to be 543,000 acres (24 percent of the decision area) available for livestock grazing and 11,900 acres (less than 1 percent of the decision area) unavailable for livestock grazing (BLM GIS 2014). Impacts on water would continue, as described under *Nature and Type of Impacts*.

Since 2006, the BLM, in coordination with permittees, has made changes in the Vermilion and Rock Creek-Mudholes allotments. Such changes include voluntarily not grazing livestock, removing feral cattle, maintaining or installing spring{ XE "Spring" } and pasture fencing, and implementing new water developments. As a result of these changes, areas that did not meet standards are now making progress toward doing so, based on recent PFC assessments. This trend would continue under Alternative A.

Alternative B

Livestock grazing would not occur under Alternative B, so there would be no impacts on water from livestock. Compared with Alternative A, none of the impacts on water from livestock that are described above under *Nature and Type of Impacts* would occur.

Impacts on water from structural and nonstructural range improvements{ XE "Range Improvement" } would still occur from proposed management under Alternative B. For example, in GSENM, the BLM would restore ranges with native species capable of minimizing erosion that results in sediment entering streams. In GSENM and Glen Canyon, structural range improvements may be removed. Removing structural range improvements would restore the natural conditions of the ranges. It would allow natural soil conditions to develop over larger areas, thereby minimizing the transport of soil capable of affecting water quality and stream conditions. Impacts on water from structural and nonstructural range improvements would be as described under *Nature and Type of Impacts*. Compared with Alternative A, Alternative B would maintain or restore water conditions over a larger area.

There would be 130.8 miles of 303(d)-listed streams on lands unavailable for livestock grazing. All 303(d)-listed streams are perennial{ XE "Perennial" } (BLM GIS 2014). Compared with

Alternative A, Alternative B would remove all livestock that contribute to water contamination, thereby increasing the opportunities for improved water quality and conditions.

Livestock grazing allotments in the decision area that do not meet Standard 4 due to livestock grazing are Rock Creek-Mudholes and Vermilion. Grazing was a contributing factor{ XE "Contributing Factor" }, but not the sole causal factor{ XE "Causal Factor" }, for Standard 4 not being met in the Headwaters, Last Chance, and Nipple Bench Allotments. Within these allotments, there would be no acres available for livestock grazing (BLM GIS 2014). Compared with Alternative A, Alternative B would remove all livestock that affect an allotment being able to meet Standard 4, thereby increasing the opportunities for the allotment to meet Standard 4 more quickly than under Alternative A.

Since 2006, the BLM, in coordination with permittees, has made changes in the Vermilion and Rock Creek-Mudholes allotments. Such changes include voluntarily not grazing livestock, removing feral cattle, maintaining or installing spring{ XE "Spring" } and pasture fencing, and implementing new water developments. As a result of these changes, those in areas that did not meet standards are now making progress toward doing so, based on recent PFC assessments. Compared with Alternative A, this trend would increase under Alternative B, because grazing that affects 303(d)-listed streams and allotments that do not meet Standard 4 would not occur.

Alternative C

There would be 1,619,700 acres (72 percent of the decision area) available for livestock grazing. There would be 63,144 active AUMs, with the projected average actual use being 33,368 AUMs. There would be 469,300 fewer acres (21 percent of the decision area) available for livestock grazing. There would be 13,813 fewer active AUMs. However, projected average actual use would be 7,975 fewer AUMs. Impacts on water from livestock would continue, as described under *Nature and Type of Impacts*. Compared with Alternative A, there would be fewer impacts on water, because less area would be grazed.

There would be 622,300 acres (28 percent of the decision area) unavailable for livestock grazing. The impacts on water from livestock described under *Nature and Type of Impacts* would not occur in this area. Compared with Alternative A, there would be an increase of 469,300 acres (21 percent of the decision area) where livestock grazing would be unavailable, resulting in fewer impacts on water from livestock grazing under Alternative C.

Impacts on water from structural and nonstructural range improvements{ XE "Range Improvement" } would occur from proposed management under Alternative C. For example, in GSENM, the BLM would maintain or restore ranges with native species. Passive restoration and non-chemical methods would be the priority for preventing the introduction, establishment, and spread of noxious weeds{ XE "Noxious Weed" } and nonnative invasive species{ XE "Invasive Species" }. Livestock grazing after native seeding{ XE "Seeding" } restoration would be modified to ensure the survival of the native plants. Impacts on water from nonstructural range improvements would occur as described under *Nature and Types of Impacts*.

In GSENM, where water developments are necessary for livestock grazing and protection of Monument objects, such developments would be fenced to protect associated wetland{ XE "Wetland" } and riparian resources, on/off valves would be put in place to ensure that water

remains in its natural course and site at all times livestock are not present in the allotment/pasture, and float valves would be used during the grazing season.

Also, new water developments would be considered within Glen Canyon outside of the proposed wilderness area. Impacts on water from structural and nonstructural range improvements{ XE "Range Improvement" } would occur, as described under *Nature and Type of Impacts*. Compared with Alternative A, livestock grazing would be managed or discontinued to reduce conflicts to resources, including water resources. Changes in grazing systems (e.g., season of use, intensity, and rotation) would be taken into consideration before range improvements are implemented. This which would minimize impacts on water, such as during critical times of the year.

Livestock grazing would occur in allotments available for grazing or trailing that contain 78.4 miles of 303(d)-listed streams. There would be 52.4 miles of 303(d)-listed streams on lands unavailable for livestock grazing. All 303(d)-listed streams are perennial{ XE "Perennial" } (BLM GIS 2014). Impacts on water would occur, as described under *Nature and Type of Impacts*. Compared with Alternative A, Alternative C would decrease livestock activities on allotments containing 14.2 miles of 303(d)-listed streams, thereby increasing the opportunities for improved water quality and conditions.

Livestock grazing allotments in the decision area that do not meet Standard 4 due to livestock grazing are Rock Creek-Mudholes and Vermilion. Grazing was a contributing factor{ XE "Contributing Factor" }, but not the sole causal factor{ XE "Causal Factor" }, for Standard 4 not being met in the Headwaters, Last Chance, and Nipple Bench allotments. Within these allotments, there would be 407,000 acres (18 percent of the decision area) available for livestock grazing and 147,900 acres (7 percent of the decision area) unavailable for livestock grazing (BLM GIS 2014). Impacts on water would occur, as described under *Nature and Type of Impacts*. Compared with Alternative A, Alternative C would decrease the acres available for livestock grazing in these allotments by 136,000 acres (6 percent of the decision area). This would increase the opportunities for the areas to meet Standard 4 more quickly than under Alternative A.

Since 2006, the BLM, in coordination with permittees, has made changes in the Vermilion and Rock Creek-Mudholes allotments. Such changes include voluntarily not grazing livestock, removing feral cattle, maintaining or installing spring{ XE "Spring" } and pasture fencing, and implementing new water developments. As a result of these changes, areas that did not meet standards are now making progress toward doing so, based on recent PFC assessments. Compared with Alternative A, this trend has the potential to increase under Alternative C. This is because grazing would decrease in allotments containing 303(d)-listed streams and allotments not meeting Standard 4.

Alternative D

There would be 2,135,200 acres (95 percent of the decision area) available for livestock grazing. There would be 107,955 active AUMs (30,998 more than under Alternative A, a 40 percent increase). However, the projected average actual use would be 42,885 AUMs. There would be 46,200 more acres (2 percent of the decision area) available for livestock grazing. Impacts on water from livestock would continue, as described under *Nature and Type of Impacts*. Compared

with Alternative A, there would be more impacts on water, because more area would be grazed.

There would be 106,800 acres (5 percent of the decision area) unavailable for livestock grazing. The impacts on water from livestock, as described under *Nature and Type of Impacts* would not occur in this area. Compared with Alternative A, there would be a decrease of 46,200 acres (2 percent of the decision area) where livestock grazing would be unavailable, resulting in more impacts on water from livestock grazing under Alternative D.

Impacts on water from structural and nonstructural range improvements{ XE "Range Improvement" } would occur from proposed management under Alternative D. For example, in GSENM, the BLM would authorize water developments for the following purposes:

- Better distribution of livestock, when deemed to have an overall beneficial impact on Monument resources, including water sources or riparian areas{ XE "Riparian Area" }, or to restore or manage native species or populations
- When they can be done only as a means of achieving MMP{ XE "Monument Management Plan, Grand Staircase-Escalante National Monument (MMP 2000)" } objectives and only when the water development would not dewater streams or springs{ XE "Spring" }

Exceptions would be allowed on a temporary basis, such as to fill troughs or storage tanks.

In GSENM, the BLM would allow experimental use of electric fences, other fence design, season of use, supplement and salt placement, water developments, and vegetation treatments{ XE "Vegetation Treatment" }, including prescribed fire. Also, new water developments would be considered within Glen Canyon, outside of the proposed wilderness area. Livestock management would promote land health improvements, which would involve water resources, including development and maintenance of nonstructural range improvements{ XE "Range Improvement" }. Management would also promote maintaining range improvements, including water development, fence repairs, fence installation, the use of machinery, and vehicle access for range improvements.

Impacts on water from structural and nonstructural range improvements{ XE "Range Improvement" } described above would be as described under *Nature and Type of Impacts*. In order to provide for the optimum level of livestock grazing and the attainment of healthy rangelands, Alternative D contains more structural and nonstructural range improvements than Alternative A.

Livestock grazing would be available on allotments containing 125.8 miles of 303(d)-listed streams. There would be 4.9 miles of 303(d)-listed streams on lands unavailable for livestock grazing. All 303(d)-listed streams are perennial{ XE "Perennial" } (BLM GIS 2014). Impacts on water would be as described under *Nature and Type of Impacts*. Compared with Alternative A, Alternative D would increase livestock grazing on allotments containing 33.2 miles of 303(d)-listed streams, thereby increasing the opportunities for livestock to alter water quality and conditions in these streams.

Livestock grazing allotments in the decision area that do not meet Standard 4 due to livestock grazing are Rock Creek-Mudholes and Vermilion. Grazing was a contributing factor{ XE "Contributing Factor" }. In these allotments, there would be 543,400 acres (24 percent of the decision area) available for livestock grazing and 11,500 acres (less than 1 percent of the decision area) unavailable for livestock grazing (BLM GIS 2014). Impacts on water would be as described under *Nature and Type of Impacts*. The impacts on water would be similar to those under Alternative A, except for the additional 380 acres under Alternative D that would be available for livestock grazing in Rock Creek-Mudholes.

Since 2006, the BLM, in coordination with permittees, has made changes in the Vermilion and Rock Creek-Mudholes allotments. Such changes include voluntarily not grazing livestock, removing feral cattle, maintaining or installing spring{ XE "Spring" } Compared with Alternative A, however, this trend in improving rangeland health{ XE "Rangeland Health" } has the potential to decrease under Alternative D. This is because grazing would increase in allotments containing 303(d)-listed streams and the allotment (Rock Creek-Mudholes) that does not meet Standard 4.

Alternative E

There would be 2,065,300 acres (92 percent of the decision area) available for livestock grazing. There would be 76,520 active AUMs, with projected average actual use being 40,100 AUMs. There would be 23,700 fewer acres (1 percent of the decision area) available for livestock grazing. There would be 437 fewer active AUMs. However, the average actual use would be 1,243 fewer AUMs. Impacts on water from livestock would continue, as described under *Nature and Type of Impacts*. Compared with Alternative A, there would be fewer impacts on water, because less area would be grazed.

There would be 176,700 acres (8 percent of the decision area) unavailable for livestock grazing. The impacts on water from livestock described under *Nature and Type of Impacts* would not occur in this area. Compared with Alternative A, there would be an increase of 23,700 acres (1 percent of the decision area) where livestock grazing would be unavailable, resulting in fewer impacts on water from livestock grazing under Alternative E.

Impacts on water from structural and nonstructural range improvements{ XE "Range Improvement" } would occur from proposed management under Alternative E. For example, in GSENM, the BLM would authorize water developments for the following purposes:

- Better distribution of livestock, when deemed to have an overall beneficial impact on Monument resources, including water sources or riparian areas{ XE "Riparian Area" }, or to restore or manage native species or populations
- When they can be done only as a means of achieving MMP{ XE "Monument Management Plan, Grand Staircase-Escalante National Monument (MMP 2000)" } objectives and only when the water development would not dewater streams or springs{ XE "Spring" }

Exceptions would be allowed on a temporary basis, such as to fill troughs or storage tanks.

New water developments would be considered within Glen Canyon outside of the proposed wilderness area. The BLM would emphasize sustainable yield through livestock management designed to ensure that BLM Utah Rangeland Health{ XE "Rangeland Health" } Standards are achieved and land health is improved, which includes water resources. Additionally, nonstructural range improvements{ XE "Range Improvement" } would be managed for both ecosystem processes and forage production.

Impacts on water from structural and nonstructural range improvements{ XE "Range Improvement" } described above would be as described under *Nature and Type of Impacts*. Compared with Alternative A, Alternative E emphasizes multiple use and sustained yield through grazing management. This is designed to ensure that BLM Utah Rangeland Health{ XE "Rangeland Health" } Standards are achieved and land health is improved.

Livestock grazing would occur in allotments available for grazing or trailing that contain 106.9 miles of 303(d)-listed streams. There would be 23.9 miles of 303(d)-listed streams on lands unavailable for livestock grazing. All 303(d)-listed streams are perennial{ XE "Perennial" } (BLM GIS 2014). Impacts on water would be as described under *Nature and Type of Impacts*. Compared with Alternative A, Alternative E would increase livestock grazing on allotments containing 14.3 miles of 303(d)-listed streams, thereby increasing the opportunities for livestock to alter water quality and conditions for these streams.

Livestock grazing allotments in the decision area that do not meet Standard 4, due to livestock grazing, are Rock Creek-Mudholes and Vermilion. Grazing was a contributing factor{ XE "Contributing Factor" }, but not the sole causal factor{ XE "Causal Factor" }, for Standard 4 not being met in the Headwaters, Last Chance, and Nipple Bench allotments. Impacts on water would be as described under *Nature and Type of Impacts*. Impacts would be similar to Alternative A, except the Rock Creek-Mudholes allotment (1,574 acres) would be a reserve common allotment{ XE "Reserve Common Allotment" } under Alternative E. This would increase the opportunities for the area to meet Standard 4, because it would likely be grazed less under Alternative E.

Since 2006, the BLM, in coordination with permittees, has made changes in the Vermilion and Rock Creek-Mudholes allotments. Such changes include voluntarily not grazing livestock, removing feral cattle, maintaining or installing spring{ XE "Spring" } and pasture fencing, and implementing new water developments. As a result of these changes, areas that did not meet standards are now making progress toward doing so, based on recent PFC assessments. Compared with Alternative A, this trend has the potential for mixed impacts on water under Alternative E. This is because livestock grazing would increase in allotments containing 303(d)-listed streams, but livestock grazing would likely decrease in the allotment (Rock Creek-Mudholes) that does not meet Standard 4.

4.6.5 Cumulative Impacts

The cumulative impacts analysis area for water resources extends outside the planning area, following watershed boundaries that completely or partially overlap it.

Past, present, and reasonably foreseeable future actions (see **Table 4-1**) and conditions within the cumulative impacts analysis area, both on public and private land, that have affected and will

likely continue to affect water are livestock grazing, vegetation management, recreation and visitor use, lands and realty, spread of noxious and invasive weeds, wildfires, and drought. In general, livestock grazing, recreation and visitor use, and lands and realty involve activities that disturb the ground surface, thereby allowing for the erosion of soil that can be transported to water resources. They also alter drainage patterns, which affects water quality and quantity. *Nature and Type of Impacts* contains additional details on how livestock grazing affects water.

Vegetation management for greater sage-grouse{ XE "Greater Sage-Grouse" }, vegetation treatments{ XE "Vegetation Treatment" }, and invasive vegetation management is conducted in the planning area. This includes managing the spread of noxious and invasive weeds through the Programmatic Noxious Weed and Invasive Plant Management Plan. Establishing and maintaining appropriate vegetation to hold soil in place reduces the erosion of soil that can be transported to water resources.

The application of prescribed fire can improve range health where vegetation relies on fire to propagate. Prescribed fire can spread the seeds of certain vegetation, improving vegetation cover and soil stability in the long term. Establishing and maintaining appropriate vegetation to hold soil in place reduces the erosion of soil that can be transported to water resources. It also creates a ground surface more capable of absorbing water. However, in the short term, prescribed fires also leave the ground surface bare and, therefore, more susceptible to the erosion of soil that can be transported to water resources.

For much of the last decade, most of the western United States has experienced drought. Precipitation is expected to decline throughout much of the year from 2015 to 2030, with the exception of a couple of months in the fall; severe droughts are likely in some areas. As vegetation is stressed or lost due to insufficient water, soil becomes more susceptible to erosion. The loss of vegetation affects the rate of water infiltration and the overland flow of surface water.

Livestock grazing allotments in the decision area that do not meet Standard 4 due to livestock grazing are Rock Creek-Mudholes and Vermilion. Grazing was a contributing factor{ XE "Contributing Factor" }, but not the sole causal factor{ XE "Causal Factor" }, for Standard 4 not being met in the Headwaters, Last Chance, and Nipple Bench allotments. Within these allotments, there would be the same number of acres available and unavailable for grazing as under Alternative A. Since 2006, the BLM, in coordination with permittees, has made changes in the Vermilion and Rock Creek-Mudholes allotments. Such changes include voluntarily not grazing livestock, removing feral cattle, maintaining or installing spring{ XE "Spring" } and pasture fencing, and implementing new water developments. As a result of these changes, areas that did not meet standards are now making progress toward doing so, based on recent PFC assessments. This trend is expected to continue and would add to other livestock grazing management actions that promote water health in order to meet BLM Utah Rangeland Health{ XE "Rangeland Health" } Standard 4.

The MMP{ XE "Monument Management Plan, Grand Staircase-Escalante National Monument (MMP 2000)" }-A alternatives rely on BLM Utah Rangeland Health{ XE "Rangeland Health" } Standards. Under the alternatives, the BLM and NPS would work toward achieving the standards in GSENM and Glen Canyon. When MMP-A alternatives are added to past, present,

and reasonably foreseeable future actions (described in **Table 4-1**), they would have cumulative impacts on water.

The alternatives would differ in the time and methods used to meet the standards and address 303(d)-listed streams. These differences are changes in acres available for livestock grazing and allowance for or restrictions on the construction or maintenance of structural and nonstructural range improvements**{** XE "Range Improvement" **}**.

Alternative B would have the greatest potential for cumulative impacts that improve water resources, due to the removal of livestock capable of affecting Standard 4 and 303(d) listing. Alternative D would have the greatest potential for cumulative impacts that degrade water resources. This would be due to the additional livestock grazing activities capable of affecting Standard 4 and potential 303(d) listing.

4.6.6 References

Behnke, R. J. 1979. Monograph of the Native Trouts of the Genus Salmo of Western North America. US Department of Agriculture, Forest Service, Rocky Mountain Region, Lakewood, Colorado.

Belnap, J., J. H. Kaltenecker, R. Rosentreter, J. Williams, S. Leonard, and D. Eldridge. 2001. Biological soil crusts**{** XE "Biological Soil Crust" **}**: Ecology and management. Technical Reference 1730-2. US Department of the Interior, Bureau of Land Management, Denver, Colorado.

BLM GIS. 2014. Base GIS data on file with the BLM's eGIS server used for calculations or figures to support the MMP**{** XE "Monument Management Plan, Grand Staircase-Escalante National Monument (MMP 2000)" **}**-A. BLM, Grand Staircase Escalante National Monument, Utah.

Bowker, M. A., J. Belnap, V. Bala Chaudhary, N. C. Johnson. 2008. "Revisiting classic water erosion models in drylands: The strong impact of biological soil crusts**{** XE "Biological Soil Crust" **}**." *Soil Biology and Biochemistry* 40:2309-2016. Accessed March 23, 2016. doi: 10.1016/j.soilbio.2008.05.008.

Clary, Warren P., Christopher Thornton, and Steven R. Abt. 1996. "Riparian stubble height and recovery of degraded streambanks." *Rangelands* 18:137-140.

Marlow, C. B., and T. M. Pogacnik. 1985. "Time of grazing and cattle-induced damage to streambanks." Paper presented at the North American Riparian Conference. The University of Arizona, Tucson. April 15-19, 1985.

National Research Council. 2002. *Riparian Areas: Functions and Strategies for Management.* National Academy Press, Washington, DC.

Platts, W. S. 1991. "Livestock grazing." In: Influence of forest and rangeland management on Salmonid fishes and their habitats. *American Fisheries Society*, Special Publication 19:389-423.

Rosgen, D. L. 1996. *Applied River Morphology*. Wildland Hydrology Books. Pagosa Springs{ XE "Spring" }, Colorado.

4.7 RECREATION

This section discusses potential impacts on recreation from proposed management actions. Existing conditions are described in **Section 3.5**, Recreation.

4.7.1 Methods of Analysis

In addition to the assumptions in **Section 4.1.1**, the analysis assumes the following:

- Recreation would continue to be a primary management focus in GSENM and Glen Canyon.
- In areas managed as available for grazing, the incidence of interactions between recreationists and livestock grazing operations would increase with increasing recreation use.
- The locations with the greatest potential for livestock grazing to affect recreation activity are at or near popular recreation areas, such as trailheads, trails, and areas within or directly adjacent to campgrounds, picnic areas, and other recreation areas, where the intensity of recreation activity and density of users is highest.
- The installation and maintenance of structural range improvements{ XE "Range Improvement" }, such as fencing, near popular recreation areas or at slot canyon entrances would decrease the potential for livestock to affect recreational experiences because livestock would be excluded from these areas.
- In the near term, nonstructural range improvement{ XE "Range Improvement" } can impede certain recreation activities by temporarily closing areas; however, in the long term, nonstructural range improvements generally improve the quality of recreation experiences by improving resource conditions that contribute to positive recreation settings and experiences.
- Where densities of livestock are higher, such as near water sources, there is greater potential for livestock to displace recreationists or impact recreation. The magnitude of impact would be the greatest where the density of livestock is high. Where both the density of livestock and recreationists are high, the impact may be experienced by more people.
- Livestock grazing contributes to the recreation setting in the planning area, with some visitors finding interest and enjoyment in observing cattle drives and grazing activities. Visitors most likely to find interest in observing grazing activities are those from outside the American West where open livestock grazing on public lands in not a typical occurrence and those participating in scenic driving, particularly on Highways 12 and 89. Other visitors may be indifferent toward the presence or absence of livestock; still others may not find interest in livestock grazing and may perceive it as detracting from the natural landscape. Visitors that encounter livestock on roadways or trails may be forced to move or seek an alternative route. These visitors may perceive grazing as affecting their desired recreation setting and

conditions in the decision area. In this analysis, the term impact is used to encompass both of these types of responses toward livestock grazing.

- Increasing travel and tourism to southern Utah will contribute to a steady rise in recreation activities and demand for recreation facilities in the planning area.

4.7.2 Factors for Analysis

Factors for analysis of impacts on recreation are the following:

BLM Factors for Analysis

- Changes in recreational settings or experiences, or conflicts with recreation planning objectives because of livestock grazing management, as affected by
  - Changes in acres available for livestock grazing
  - Allowance for or restrictions on the construction or maintenance of new structural and nonstructural range improvements**{** XE "Range Improvement" **}**
  - Changes in density of AUMs for livestock (acres available per AUM)

NPS Factors for Analysis

- A change in the NPS's ability to provide for public enjoyment through diverse land- and water-based recreation, as affected by
  - Changes in acres available for livestock grazing
  - Allowance for or restrictions on the construction or maintenance of new structural and nonstructural range improvements**{** XE "Range Improvement" **}**
  - Changes in density of AUMs for livestock (acres available per AUM)

4.7.3 Nature and Type of Impacts

On BLM-managed lands, recreation experiences and the attainment of a variety of outcome-focused objectives are vulnerable to livestock grazing management. Examples of this management are those that would alter the settings and opportunities in a particular area, that would increase the frequency of interaction between livestock or evidence of livestock and recreation, or that would physically displace recreation activities.

In Glen Canyon, where recreation is a central management focus, any change in livestock grazing management that would alter the NPS's ability to provide visitors with enjoyable land- and water-based recreation opportunities would be considered an impact on recreation.

Recreation settings and experiences are based on a variety of attributes, such as remoteness, evidence of other types of recreation users or uses, available recreation facilities, and restrictions and controls that increase or decrease users' ability to participate in a given activity. Livestock grazing management actions that impact these attributes could affect the quality and quantity of recreation experiences. In SRMAs**{** XE "Special Recreation Management Area (SRMA)" **}**, where BLM management emphasizes the attainment of specific recreation objectives, livestock grazing could affect the BLM's ability to meet those objectives.

In areas available for livestock grazing, the density of livestock per acre directly influences the likelihood for grazing to affect recreation. In general, the potential for impacts on the quality and quantity of recreation opportunities from livestock grazing would be highest where there is a high density of recreation and livestock activity. In areas with fewer livestock per acre, there would be less potential for impacts on recreation from soil compaction, degradation of riparian areas{ XE "Riparian Area" }, dust, and the presence of cattle manure, including its odor. A lower density of livestock use would also decrease the likelihood for livestock to physically displace recreationists or impede users' ability to access trails or recreation sites.

Livestock grazing on public lands is a long-standing component of western landscapes, including GSENM and Glen Canyon. For many visitors to the planning area, there is an expectation to experience cattle grazing. Accordingly, changes to AUMs and areas available or unavailable for grazing would directly impact the quantity and quality of livestock grazing-related experiences in the decision area. Where livestock grazing affects recreation, managing areas as unavailable for livestock grazing would eliminate the potential for livestock to affect the quality of recreation settings or experiences in those areas.

Structural range improvements{ XE "Range Improvement" } can help reduce the impact of grazing on recreation by prohibiting animals from wandering onto roads, trails, or developed recreation sites, limiting the direct interaction of livestock and recreationists. Properly placed range improvements that protect and promote land health can also enhance the naturalness of an area. This would come about by managing utilization{ XE "Utilization" } in support of the natural surroundings. However, improperly placed or maintained barrier fencing and other structural range improvements could create unnecessary impediments to access or alter recreation settings.

The nature and type of impacts on recreation from livestock grazing can be localized (i.e., impacting a small area), but result in a more intense change in the recreation setting and opportunities. For example, developing and maintaining structural range improvements{ XE "Range Improvement" }. This is because such features as stock ponds and catchments contrast with the natural landscape. The impact on recreation, however, would be limited to the location of the range improvements and, to a lesser extent, in nearby areas where the features would be visible. Frequent livestock use can also degrade water sources and soil conditions, which would change the recreation setting characteristics and user experiences in those areas.

The nature and types of livestock impacts on recreation also vary in duration and intensity. For instance, the presence of cattle and ranchers on a few acres in a remote area can temporarily alter the setting characteristics at a low intensity. If the cattle were more dispersed and in an area for a longer period, the impact intensity would remain low, but the duration of the impacts would be more sustained. This is because they would be visible over a larger area.

Livestock waste can also temporarily degrade recreation settings and experiences, particularly when present on popular trails or other recreation sites. The presence of isolated waste on a trail would be a temporary, low to moderate intensity impact; however, widespread waste would result in a longer-term, higher intensity change in the setting characteristics, user experience, conflicts with planning objectives, and in users' ability to recreate.

4.7.4 Direct and Indirect Impacts

Impacts Common to Alternatives A, C, D, and E

While maximum permitted AUMs vary across alternatives, the density of average actual use AUMs only varies slightly, between 49 and 52 acres available per AUM. There are 52 acres available per AUM under Alternative E, 51 acres available per AUM for Alternative A, 50 acres available per AUM for Alternative D, and 49 acres available per AUM for Alternative C.

For the allotments described in **Section 3.5.1** under *Recreational Use in Allotments Potentially Unavailable for Livestock Grazing*, making these allotments unavailable would foreclose the potential for livestock grazing to impact the recreational setting or experiences associated with these allotments.

Impacts on recreation from livestock grazing can be mitigated in various ways, depending on the area. For example, hiker mazes[1] or fencing near the entrance of slot canyons can be used to prevent cattle from getting stuck. Educating recreationists about what they should do if they encounter livestock in these situations may also reduce instances of recreationists driving cattle farther up slot canyons. In wider canyons, where fencing is less practical, changes in season of use to off-peak recreation seasons can mitigate interactions between humans and livestock. Changes in stocking rates**{** XE "Stocking Rate" **}** can also reduce the evidence of livestock and mitigate impacts on user experiences.

Alternative A

In the 2,089,000 acres managed as available for livestock grazing under Alternative A, there would be the potential for livestock grazing to affect recreation settings and experiences or conflict with planning objectives.

The greatest potential for impacts is in the 984,200 acres of SRMAs**{** XE "Special Recreation Management Area (SRMA)" **}** overlapping areas available for livestock grazing. Within the SRMAs, visitor use is highest in the Escalante Canyons, Paria-Hackberry, and Highway 12 Corridor SRMAs, where there were 200,300, 110,400, and 68,200 backcountry visits, respectively, in 2014 (BLM 2014). There are 468,700 acres (92 percent) available for grazing in the Escalante Canyons SRMA, 271,500 acres (100 percent) available for grazing in the Paria-Hackberry SRMA, and 23,600 acres (98 percent) available for grazing in the Highway 12 Corridor SRMA. Impacts and recreation settings and quality and quantity of recreation experiences in these areas is consistent with those described in the *Nature and Type of Impacts*. Where the intensity of conflict is highest, it may not be possible to meet SRMA objectives for some activities. In the 153,000 acres (7 percent) of the planning area unavailable for grazing, there may be impacts on recreation, depending on the preferences of the recreationists.

Impacts on recreation settings and the quality and quantity of recreation experiences from structural range improvements**{** XE "Range Improvement" **}** is consistent with those described in the *Nature and Type of Impacts*. New range improvements developed consistent with the

[1]A hiker maze is an opening in a fence which uses a series of offset fences to restrict access by livestock while still allowing for people to walk through the opening.

current MMP{ XE "Monument Management Plan, Grand Staircase-Escalante National Monument (MMP 2000)" } could improve recreation settings and experiences and avoid conflicts with planning objectives by separating grazing use from recreation areas. However, additional improvements, particularly in the Outback and Primitive Recreation Management Zones, would not be consistent with undeveloped, primitive recreation settings in those areas.

Alternative B

Under Alternative B, the decision area would be unavailable for livestock grazing. Removing grazing from the decision area would eliminate the impacts on recreational settings and experiences where the preference is to not see livestock or presence of livestock. The BLM would be able to meet SRMA objectives. On the other hand, Alternative B would also eliminate opportunities for visitors to experience cattle ranching activities. This would eliminate opportunities for visitors desiring to observe that activity resulting in a lower overall quality recreation setting and experience for those visitors.

Removing structural range improvements{ XE "Range Improvement" } would eliminate the potential for those features to obstruct recreation access, conflict with SRMA objectives, or modify recreation settings.

Alternative C

Managing 1,619,700 acres (72 percent) of the decision area as available for livestock grazing, would reduce the overall area where grazing could impact recreation by 22 percent (469,300 acres), compared with Alternative A. In SRMAs{ XE "Special Recreation Management Area (SRMA)" }, there would be a 23 percent (226,300 acres) reduction in areas available for grazing. This includes the Escalante Canyons, Paria-Hackberry, and Highway 12 Corridor SRMAs, where recreation use in the planning area is highest. Alternative C would reduce the areas available for grazing by 21 percent (98,400 acres) in the Escalante Canyons SRMA, by 23 percent (61,4000 acres) in the Paria-Hackberry SRMA, and by 42 percent (9,900 acres) in the Highway 12 Corridor SRMA. In these areas, managed as unavailable for grazing under Alternative C, there would be no potential for grazing to impact the settings or conflict with SRMA objectives, where recreationists prefer to not see livestock or their evidence. Where the preference is to see livestock, recreation experiences would be reduced in areas that are unavailable for livestock grazing.

Alternative C would also change the impact of livestock grazing on recreation. This would come about by decreasing maximum AUMs in the planning area by 13 percent and projected average actual use AUMs by 19 percent, compared with Alternative A. In areas available for grazing, Alternative C would maintain the potential for livestock to directly obstruct recreation activities or directly or indirectly change the recreation setting.

Reducing the amount of area and stocking rates{ XE "Stocking Rate" } would decrease opportunities for visitors to observe cattle grazing. Impacts would be consistent with those described in *Nature and Type of Impacts*.

Impacts from structural range improvements{ XE "Range Improvement" } would be similar to Alternative A and those described in *Nature and Type of Impacts*. In the 469,300 additional acres made unavailable for grazing, the BLM and NPS would evaluate opportunities to remove existing

structural range improvements. This would reduce barriers to access and improve the overall recreation experience.

Season of use management under Alternative C would reduce the potential for livestock grazing to be present at the same time as recreationists, particularly at high-use recreation areas during late spring{ XE "Spring" }. This would impact recreationists in areas where they prefer to not see livestock or their evidence.

Alternative D

Compared with Alternative A, there would be 46,200 more acres available for grazing under Alternative D, which would result in a 2 percent increase in the overall portion of the planning area where livestock grazing could impact recreation settings and activities. There are 1,016,300 acres of SRMAs{ XE "Special Recreation Management Area (SRMA)" } available for grazing under Alternative D, an increase of 32,100 acres, compared with Alternative A. Escalante Canyon SRMA and Paria-Hackberry SRMA, the two most visited SRMAs in the planning area, would have 33,000 acres (6 percent) more acres available for grazing and 1,500 (less than 1 percent) fewer acres available for grazing, respectively.

The potential for grazing to impact recreation and modify the recreation settings in these areas would increase, compared with Alternative A. In SRMAs, particularly in areas with high visitor use, it would be more difficult to meet SRMA objectives for some activities compared with Alternative A. Throughout the remainder of the planning area, the potential for livestock to affect the quality or quantity of recreation experiences or modify the recreation setting would be the same as Alternative A.

Potential impacts from structural range improvements{ XE "Range Improvement" } would be similar to Alternative A, with the exception that new line cabins in Glen Canyon could modify the recreation setting. If developed in remote areas, new cabins could reduce the quality of primitive recreation settings and experiences and conflict with SRMA planning objectives that support primitive recreation experiences.

Alternative E

Alternative E would manage 23,700 (1 percent) fewer overall acres and a net 17,600 (2 percent) fewer acres in SRMAs{ XE "Special Recreation Management Area (SRMA)" } as available for grazing resulting in nearly the same geographic area as Alternative A where impacts on recreation from grazing could occur. While Alternative E would reduce the maximum AUMs permitted in the planning area by 437 (less than 1 percent), the projected average actual use AUMs would only decrease by 1,243 (3 percent), resulting in nearly the same potential for impacts on recreation as Alternative A. Potential short-term and long-term, direct and indirect impacts from the presence of livestock would be consistent with those described in *Nature and Type of Impacts*.

The potential for structural range improvements{ XE "Range Improvement" } to impact recreation activities and modify recreation settings would be the same as under Alternative A.

Adaptively managing season of use, duration, distribution, and stocking rates{ XE "Stocking Rate" } would reduce the potential for recreation use and livestock to be present at the same time or

for recreationists to experience sustained evidence of livestock use. Reducing or temporarily eliminating grazing from areas next to Highways 12 and 89 would limit visitors' opportunities to observe grazing from those roadways.

4.7.5 Cumulative Impacts

The cumulative impacts analysis area for recreation is the planning area. Within the cumulative impacts analysis area, under Alternatives A, C, D, and E, the increasing intensity and geographic distribution of recreation activities would cumulatively increase the potential for livestock grazing to impact recreation settings and experiences and conflict with planning objectives in SRMAs. Recreation settings and experiences are also impacted by the presence of other recreationists and the types of recreation that they are engaging in. Under all alternatives, meeting recreation planning objectives would become increasingly difficult because of increasing visitation, particularly in SRMAs. Cumulative impacts on SRMA objectives from grazing would be the least under Alternative B.

Implementing the Programmatic EA for Group Activities along Hole-in-the-Rock Road would enhance future management of group recreation activities along Hole-in-the-Rock Road by designating a camping area and limiting group sizes. Under Alternatives A, C, D, and E, this management would reduce the potential for permitted group activities to be impacted by grazing along Hole-in-the-Rock Road. In addition, the action should help to mitigate the impacts of increasing recreation. Similar impacts would be realized by implementing the improvements at the Calf Creek area identified in the Calf Creek Recreation Area Site Improvements EA (BLM 2016).

Alternatives A, C, D, and E would maintain opportunities for an increasing number of visitors to experience cattle grazing on public lands, which is a unique aspect of the American West. Alternative B would eliminate those opportunities. The steady decline in actual grazing use that has occurred over the past several decades, and is expected to continue, would reduce the number of visitors experiencing grazing in the planning area. For those visitors expecting to observe cattle grazing during their recreation activity, fewer or no cattle would result in a lower quality overall recreational experience. Alternatively, some visitors may perceive this change as increasing the quality of their recreational experience.

4.7.6 References

BLM (United States Department of the Interior, Bureau of Land Management). 2016. Environmental Assessment for Calf Creek Recreation Area Site Improvements. GSENM, Kanab, Utah. December 2016. Internet website: https://eplanning.blm.gov/epl-front-office/projects/nepa/70850/94367/113873/Calf_Creek_Recreation_Area_Improvements_EA.pdf.

4.8 AIR QUALITY AND CLIMATE

This section discusses potential impacts on air quality from proposed management actions. It also addresses the potential change in the levels of greenhouse gas emissions that would be produced under each alternative. The potential impacts of climate change on resources in the planning area are addressed in the cumulative impact sections for those resources.

4.8.1 Methods of Analysis

Air resources were evaluated within the planning area to determine how air quality could be affected by future federal actions implemented under this MMP{ XE "Monument Management Plan, Grand Staircase-Escalante National Monument (MMP 2000)" }-A. Actions that initiate or increase emissions of air pollutants can result in impacts on air resources; actions that reduce or control emissions of air pollutants can improve air quality and prevent degradation. This section addresses the potential impacts of air pollutant emissions from specific activities that would be authorized, allowed, or performed in the planning area by the BLM or NPS under each alternative.

A qualitative approach was used for analyzing impacts on air quality based on an understanding of the current air quality conditions and trends in the planning area, described in **Section 3.6**, Air Quality and Climate Change. The qualitative approach involves identifying the pollutants associated with the proposed management actions, describing the relative magnitude of emissions changes compared with current management, and indicating the extent of potential impacts. This approach provides an appropriate basis to compare the potential impacts under the various alternatives. A quantitative approach was not selected because of the limited emission-generating sources or actions proposed under this MMP{ XE "Monument Management Plan, Grand Staircase-Escalante National Monument (MMP 2000)" }-A.

The section also evaluates changes in greenhouse gas emissions and carbon storage that may occur as a result of actions proposed under each alternative. A qualitative approach was used similar to that described above for air quality, with the exception of greenhouse gas emissions associated with livestock grazing. These were analyzed quantitatively, based on the number of AUMs allowed under each alternative.

The analysis makes the following assumptions:

- There is a correlation between global concentrations of greenhouse gases and climate change. However, it is not currently possible to link projected greenhouse gas emissions associated with any particular activity to specific environmental impacts at a specific site or location.
- BMPs will be implemented during implementation-level actions as applicable to the specific project and site location. BMPs that minimized or restored surface disturbance would minimize particulate emissions related to wind erosion and fugitive dust.

4.8.2 Factors for Analysis

Factors of analysis for impacts on air quality and climate change are the following:

- Changes in air pollutant and greenhouse gas emissions because of livestock grazing management, as affected by:
  - Changes in acres available or unavailable for livestock grazing
  - Changes in density of AUMs for livestock (acres available per AUM)

– Allowance for or restrictions on the construction or maintenance of structural and nonstructural range improvements{ XE "Range Improvement" }

4.8.3 Nature and Type of Impacts

Air quality is affected by actions that introduce pollutants into the atmosphere. The degree of impact depends on the amount of pollutants emitted, the existing air quality of a region, and localized conditions, such as temperature, wind speed and direction, precipitation, and topography. Sources of emissions related to livestock grazing and livestock grazing management are combustion sources, such as vehicles used by ranchers to access their allotments and by the BLM for administration of grazing allotments, construction equipment used in structural range improvements{ XE "Range Improvement" }, and equipment used in nonstructural range improvements, such as mechanical vegetation treatments{ XE "Vegetation Treatment" }. Another source of air pollutants are particulate emissions (PM_{10} and $PM_{2.5}$) from surface disturbance and wind erosion.

Particulate matter{ XE "Particulate Matter" } is directly emitted during ground-disturbing activities and vehicular traffic on unpaved roads and surfaces. It is indirectly emitted through windblown dust in areas susceptible to wind erosion. Surface-disturbing activities, such as trampling, grazing, or structural range improvements{ XE "Range Improvement" } that remove plant communities, can indirectly impact air resources. Because plants stabilize the soil, their loss increases the potential for soil erosion, and thus wind erosion (Manier et al. 2013).

Concentrated livestock grazing (higher density grazing) can disturb soils and break apart biotic soil crusts, making soils susceptible to windblown dust. This condition can be exacerbated by drought. As described in **Section 4.5**, Soil Resources, Bowker et al. (2008) showed that biological soil crusts{ XE "Biological Soil Crust" } are a primary factor in the acceleration or reduction of soil erosion in some soils in arid landscapes, such as GSENM. Biological soil crusts are especially sensitive to surface-disturbing activities related to livestock grazing, such as structural range improvements{ XE "Range Improvement" } or trampling of soils (Memmott et al. 1998).

Fugitive particulate emissions could increase ambient concentrations of PM_{10} and $PM_{2.5}$, resulting in localized impacts on vegetation and increases in atmospheric deposition. Particulate matter{ XE "Particulate Matter" } also impairs visibility.

Management actions that improve rangeland health{ XE "Rangeland Health" } by stabilizing soils could indirectly affect air quality in the long term by reducing particulate emissions from exposed soils. Actions that improve rangeland health by reducing nonnative and invasive plant{ XE "Invasive Species" } species would improve resiliency of vegetation over the long term and decrease susceptibility to wildfire, a significant if temporary source of particulate emissions.

Livestock grazing and its associated activities are not a significant source of ozone{ XE "Ozone" } precursor emissions (volatile organic compounds and nitrogen oxides) or other criteria pollutant{ XE "Criteria Pollutant" } emissions in the planning area relative to other sources occurring in and outside of the planning area (see **Section 4.8.5**, Cumulative Impacts).

Greenhouse gases contribute to the natural greenhouse effect. They include carbon dioxide, methane, nitrous oxide, and water vapor, as well as manufactured gases, such as hydrofluorocarbons, chlorinated fluorocarbons, and sulfur hexafluoride. Actions that increase greenhouse gas emissions, actions that reduce greenhouse gas emissions, actions that create carbon sinks, and actions that remove carbon sinks could affect climate change. The primary sources of greenhouse gas emissions related to livestock grazing are combustion sources, such as vehicles, construction equipment, and maintenance equipment, and enteric fermentation from domestic livestock on grazing allotments.

Fuel-burning equipment releases primarily carbon dioxide and small amounts of methane. Equipment use related to livestock grazing and livestock grazing management is not a large source of greenhouse gas emissions in the planning area.

Ruminant livestock,[1] such as cattle, are a primary source of methane emissions in the United States; in 2014, enteric fermentation and manure management represented about 23 percent and 9 percent of total methane emissions from human-caused activities, respectively (EPA 2016). Animals that are not ruminants, such as horses, also produce methane emissions but at a much lower level (EPA 2016).

Nonstructural range improvements**{** XE "Range Improvement" **}** that reduce woodland encroachment would also contribute to climate change. Woodlands tend to store more carbon due to greater aboveground biomass and greater total root biomass (Pinno and Wilson 2011). Because woodlands tend to store more carbon, removal of woodland and conversion to another plant community would reduce carbon storage potential. Conversely, vegetation and soil management actions that improve rangeland health**{** XE "Rangeland Health" **}** could indirectly affect climate change by improving vegetation resiliency and decreasing the potential for uncontrolled wildfire. Fires can emit large quantities of greenhouse gases into the atmosphere, including carbon dioxide, methane, and nitrous oxide; fires also remove vegetation that act as a carbon sink.

4.8.4 Direct and Indirect Impacts

Impacts Common to Alternatives A, C, D, and E

While maximum permitted AUMs vary across alternatives, the density of average actual use AUMs only varies slightly, between 49 and 52 acres available per AUM. There are 52 acres available per AUM under Alternative E, 51 acres available per AUM for Alternative A, 50 acres available per AUM for Alternative D, and 49 acres available per AUM for Alternative C. Consequently, soil erosion impacts from livestock grazing density and the related impacts on air quality from windblown particulate emissions as identified under *Nature and Type of Impacts* would generally be the same across alternatives. As described above, livestock grazing and its associated activities are not a significant source of air pollutant emissions in the planning area.

[1] An animal that has more than one stomach.

Livestock emit methane from digestive fermentation. As described under *Nature and Type of Impacts*, ruminant livestock, such as cattle, are a primary source of methane emissions in the US (EPA 2016). Animals that are not ruminants, such as horses, also produce methane emissions, but at a much lower level (EPA 2016). While the maximum permitted AUMs differ across alternatives, the projected average actual use AUMs would be similar. Because the number of AUMs allocated by livestock type was not available, a conservative estimate of greenhouse gas emissions from enteric fermentation, assuming all AUMs are cattle, is provided below.

Methane emission rates from cattle vary widely and depend on many variables, including feed composition. An average emission factor of 4.4 kilograms of methane per month was used to calculate emissions; this emission factor was based on the average annual emission factors in North America for beef cattle, divided by 12 months (IPCC 2006). Since methane has a global warming potential 21 times that of carbon dioxide, each AUM results in 0.0924 metric tons of carbon dioxide equivalent (CO_2e), as follows:

AUMs x (4.4 kilograms methane/month) ÷ (1,000 kilograms/metric ton) x 21 = metric tons CO_2e

Methane emissions from average AUMs by alternative are shown in **Table 4-6**, Greenhouse Gas Emissions Estimate from Livestock.

Table 4-6
Greenhouse Gas Emissions Estimate from Livestock

Alternative	Projected Average Actual Use in AUMs	Livestock Grazing Emissions (Metric Tons CO_2e)
Alternative A	41,343	3,820
Alternative B	0	0
Alternative C	33,368	3,080
Alternative D	42,885	3,960
Alternative E	40,100	3,705

For comparison purposes only, emissions from livestock grazing in the decision area represents less than 0.0001 percent of Utah's total 2011 greenhouse gas emissions of 74 million metric tons of CO_2e under all alternatives (World Resources Institute 2014).

The mitigation for impacts of livestock grazing on air quality is reduction or removal. However, in some instances, reduction or removal from the decision area would only displace grazing and its impacts to a different location. The impact of livestock grazing in the decision area is very small, as previously described.

Alternative A

Under Alternative A, there would continue to be 2,089,000 acres (93 percent of the decision area) available for livestock grazing. Livestock grazing would continue to occur at existing permitted levels (76,957 active AUMs of a maximum permitted 106,202 AUMs). Average actual use would continue to be approximately 41,343 AUMs. Criteria pollutant**{** XE "Criteria Pollutant" **}** emissions and greenhouse gas emissions related to vehicles and equipment used by

permittees in livestock grazing use would continue at current levels and would not be a significant source of combustion-related emissions in the decision area.

Direct impacts on air quality from travel on unpaved surfaces and indirect impacts from livestock grazing-related windblown dust from soil erosion would be the same as described under *Nature and Type of Impacts* and *Impacts Common to Alternatives A, C, D, and E*. Management actions implemented to meet BLM Utah Rangeland Health{ XE "Rangeland Health" } Standards, such as soil protection measures, would result in a decrease in fugitive particulate emissions over the life of this MMP{ XE "Monument Management Plan, Grand Staircase-Escalante National Monument (MMP 2000)" }-A. On NPS-managed lands, additional criteria beyond BLM Utah Rangeland Health Standards may be required, as specified in the 1999 GzMP{ XE "Grazing Management Plan, Glen Canyon (GzMP 1999)" } and other NPS policies. This is supported by the trend that many allotment areas that were not meeting the rangeland health standards are now making progress toward meeting them, based on recent upland assessments.

Structural range improvements{ XE "Range Improvement" } would have short-term direct impacts on air quality from equipment used to construct structural range improvements and from surface disturbance while constructing these range improvements. Nonstructural range improvements also would have temporary direct impacts on air quality, which would vary, depending on the type and extent of the treatment. These impacts would be as identified in the under *Nature and Type of Impacts*.

A variety of treatments would be allowed, including mechanical, chemical, and prescribed fires. Each of these treatment methods would have short-term, direct impacts. Mechanical treatments would have exhaust-related criteria pollutant{ XE "Criteria Pollutant" } and greenhouse gas emissions from equipment use. Chemical treatments would emit small amounts of volatile organic compounds from herbicide application.

Prescribed fire would emit ozone{ XE "Ozone" } precursor emissions (nitrogen oxides and volatile organic compounds), which could result in locally high ozone concentrations. Fire treatments would also emit particulates, which could reduce visibility, and greenhouse gas emissions, including carbon dioxide, methane, and nitrous oxide. Fires also remove vegetation that acts as a carbon sink. Prescribed fire has not been used historically in the decision area; if used, it would be subject to any state permit requirements for prescribed burning.

Each of these treatment methods also would expose soils and make them susceptible to erosion in the short term until new vegetation becomes established. Over the long term, nonstructural improvements may improve vegetation health. This could improve resiliency of vegetation over the long term, decrease the potential for fugitive particulate emissions from soil erosion, decrease susceptibility to wildfire, and increase carbon storage in soils and vegetation.

Greenhouse gas emissions from enteric fermentation would be similar to those described under *Impacts Common to Alternatives A, C, D, and E* and would be a small incremental source of greenhouse gas emissions in the planning area.

Alternative B

Livestock grazing would not occur under Alternative B, so there would be no direct impacts on air quality from that use. Exposed soils would continue to be a source of fugitive dust emissions until actively or passively restored.

Removing structural range improvements{ XE "Range Improvement" } would have short-term direct impacts from the equipment used and from surface disturbance while the range improvements are removed.

As described under Alternative A, management actions implemented to meet BLM Utah Rangeland Health{ XE "Rangeland Health" } Standards would result in a decrease in fugitive particulate emissions over the life of the MMP{ XE "Monument Management Plan, Grand Staircase-Escalante National Monument (MMP 2000)" }-A. Eliminating livestock grazing would result in a greater reduction in fugitive particulate emissions from direct vegetation and soil disturbance over the life of the MMP-A, compared with Alternative A.

Temporary direct impacts from vegetation treatment{ XE "Vegetation Treatment" } actions would be the same as those described for Alternative A. Over the long term, nonstructural improvements may improve vegetation health. This could improve resiliency of vegetation over the long term, decrease the potential for fugitive particulate emissions from soil erosion, decrease susceptibility to wildfire, and increase carbon storage in soils and vegetation.

Under Alternative B, there would be no livestock grazing. Eliminating livestock grazing would eliminate greenhouse gas emissions from this source in the decision area and would reduce greenhouse gas emissions, compared with Alternative A. In the planning area, greenhouse gas emissions from livestock grazing would remain the same, if livestock that historically grazed on decision area lands were shifted to lands outside of the decision area, rather than grazing being reduced or eliminated. As described under *Impacts Common to Alternatives A, C, D, and E,* livestock grazing is a small incremental source of greenhouse gas emissions in the planning area.

Overall, Alternative B would have fewer criteria pollutant{ XE "Criteria Pollutant" } and greenhouse gas emissions, compared with Alternative A. In addition, carbon storage levels under Alternative B would likely increase, compared with Alternative A, through passive and active restoration of previously grazed lands in the decision area.

Alternative C

Under Alternative C, there would be 1,619,700 acres (72 percent of the decision area) available for livestock grazing. There would be 63,144 of active AUMs, with a projected average actual use of 33,368 AUMs (a reduction of 7,975 AUMs, compared with Alternative A).

Criteria pollutant{ XE "Criteria Pollutant" } emissions and greenhouse gas emissions related to vehicles and equipment used by allottees in livestock grazing use would likely be less than under Alternative A. This would be due to the lower level of areas available for grazing and the reduction in AUMs.

Direct impacts on air quality from travel on unpaved surfaces and indirect impacts from livestock grazing-related windblown dust from soil erosion would be similar to those described

under *Nature and Type of Impacts* and *Impacts Common to Alternatives A, C, D, and E*. Compared with Alternative A, the area where livestock activities would occur on sensitive soils and biological crust would decrease by 19 percent of the decision area. This would provide more protection to these soil types and would decrease windblown particulate emissions over the life of the MMP{ XE "Monument Management Plan, Grand Staircase-Escalante National Monument (MMP 2000)" }-A.

As described under Alternative A, management actions implemented to meet BLM Utah Rangeland Health{ XE "Rangeland Health" } Standards would result in a decrease in fugitive particulate emissions over the life of the MMP{ XE "Monument Management Plan, Grand Staircase-Escalante National Monument (MMP 2000)" }-A. Reductions in livestock grazing would improve the likelihood of meeting BLM Utah Rangeland Health Standards in more areas, compared with Alternative A. This is because some areas not meeting standards would be permanently or temporarily removed from grazing. This would result in a greater reduction in fugitive particulate emissions from vegetation and soil disturbance over the life of the MMP-A, compared with Alternative A.

Impacts from structural range improvements{ XE "Range Improvement" } would be the same as described under Alternative A.

Nonstructural range improvements{ XE "Range Improvement" } would have temporary direct impacts on air quality, as identified under *Nature and Type of Impacts*. Under Alternative C, passive restoration and non-chemical treatment methods would be prioritized, resulting in fewer emissions of criteria pollutant{ XE "Criteria Pollutant" } and greenhouse gas emissions, compared with Alternative A. Passive restoration would have no impacts. Impacts from mechanical treatments and prescribed fire would be the same as described under Alternative A. Over the long term, nonstructural improvements may improve vegetation health. This could improve resiliency of vegetation over the long term, decrease the potential for fugitive particulate emissions from soil erosion, decrease susceptibility to wildfire, and increase carbon storage in soils and vegetation.

Greenhouse gas emissions from enteric fermentation would be similar to those described under *Impacts Common to Alternatives A, C, D, and E* and would be a small incremental source of greenhouse gas emissions in the planning area.

Overall, Alternative C would have fewer criteria pollutant{ XE "Criteria Pollutant" } and greenhouse gas emissions, compared with Alternative A. In addition, carbon storage levels under Alternative C would likely increase, compared with Alternative A.

Alternative D

Under Alternative D, the BLM would increase the acres available for grazing (2,135,200 acres). There would be 107,955 active AUMs, a 40 percent increase, compared with Alternative A. Projected average actual use AUMs would be 42,885 AUMs, a 4 percent increase, compared with Alternative A.

Direct impacts on air quality from travel on unpaved surfaces and indirect impacts from livestock grazing-related windblown dust from soil erosion would be the same as described

under *Nature and Type of Impacts* and *Impacts Common to Alternatives A, C, D, and E*. Compared with Alternative A, the area where livestock activities would occur on sensitive soils and biological crust would increase by 3 percent of the decision area, thereby providing less protection to these soil types over the life of the MMP{ XE "Monument Management Plan, Grand Staircase-Escalante National Monument (MMP 2000)" }-A, compared with Alternative A.

As described under Alternative A, management actions implemented to meet BLM Utah Rangeland Health{ XE "Rangeland Health" } Standards, such as soil protection measures, would result in a decrease in fugitive particulate emissions over the life of this MMP{ XE "Monument Management Plan, Grand Staircase-Escalante National Monument (MMP 2000)" }-A. This trend would continue but at a slightly lower rate than under Alternative A.

Impacts related to structural range improvements{ XE "Range Improvement" } and nonstructural range improvements would be slightly greater than those described under Alternative A. In order to provide for the optimum level of livestock grazing and the attainment of healthy rangelands, Alternative D contains more structural and nonstructural range improvements than Alternative A. Over the long term, nonstructural improvements may improve vegetation health, which may improve the resiliency of vegetation over the long term, decrease the potential for fugitive particulate emissions from soil erosion and susceptibility to wildfire, and increase carbon storage in soils and vegetation.

Greenhouse gas emissions from enteric fermentation would be similar to those described under *Impacts Common to Alternatives A, C, D, and E* and would be a small incremental source of greenhouse gas emissions in the planning area.

Overall, Alternative D would have slightly greater criteria pollutant{ XE "Criteria Pollutant" } and greenhouse gas emissions, compared with Alternative A. In addition, carbon storage levels under Alternative D would be similar to or slightly less than under Alternative A.

Alternative E

Under Alternative E, there would be 2,065,300 acres (92 percent of the decision area) available for livestock grazing. There would be 76,520 active AUMs, with a projected average actual use of 40,100 AUMs (a reduction in average actual use of 1,243 AUMs, compared with Alternative A).

Criteria pollutant{ XE "Criteria Pollutant" } emissions and greenhouse gas emissions related to vehicles and equipment used by allottees in livestock grazing use would be the same as or slightly less than Alternative A, given the slightly lower acreage available to grazing and slightly fewer AUMs.

Direct impacts on air quality from travel on unpaved surfaces and indirect impacts from livestock grazing-related windblown dust from soil erosion would be the same as those described under *Nature and Type of Impacts* and *Impacts Common to Alternatives A, C, D, and E*. As described under Alternative A, management actions implemented to meet BLM Utah Rangeland Health{ XE "Rangeland Health" } Standards, such as soil protection measures, would result in a decrease in fugitive particulate emissions over the life of this MMP{ XE "Monument Management

Plan, Grand Staircase-Escalante National Monument (MMP 2000)" }-A. This trend would likely continue, as described for Alternative A.

Impacts related to structural range improvements{ XE "Range Improvement" } and nonstructural range improvements would be the same as those described under Alternative A. Over the long term, nonstructural improvements may improve vegetation health. This could improve resiliency of vegetation over the long term, decrease the potential for fugitive particulate emissions from soil erosion and susceptibility to wildfire, and increase carbon storage in soils and vegetation.

Greenhouse gas emissions from enteric fermentation would be similar to those described under *Impacts Common to Alternatives A, C, D, and E* and would be a small incremental source of greenhouse gas emissions in the planning area.

Overall, Alternative E would have the same or slightly fewer criteria pollutant{ XE "Criteria Pollutant" } and greenhouse gas emissions, compared with Alternative A. In addition, carbon storage levels under Alternative E would likely be similar to or slightly more, compared with Alternative A.

4.8.5 Cumulative Impacts

The cumulative impacts analysis area for air quality is the planning area for localized pollutants, such as PM_{10}, and the air basin{ XE "Air Basin" } for regional pollutants, such as volatile organic compounds and nitrogen oxides; these compounds mix in the atmosphere to form ozone{ XE "Ozone" }. A separate discussion of greenhouse gases and carbon storage is provided after the cumulative air quality discussion.

Past and present actions in the planning area and in the larger region have affected air quality. In Garfield County, non-road and on-road mobile sources are the largest sources of most pollutant emissions; area sources are the largest sources of particulate emissions and biogenic sources[2] the largest sources of volatile organic compound emissions (Utah Division of Air Quality 2016). The 2014 statewide inventory shows similar pollutant emission levels in Kane County as in Garfield County (Utah Division of Air Quality 2016).

In addition to emission sources in these counties, air quality in the planning area is affected by emissions outside of the planning area. These include pollutants from urban areas, such as Los Angeles and Las Vegas, pollutant emissions from power generating plants, such as the Navajo Steam Plant outside Page, Arizona, oil and gas activities, and wildfire that occurs upwind of the planning area.

An additional source of area emissions is naturally occurring underground coal in the Burning Hills area on the Kaiparowits Plateau. Coal seams in this area can be ignited by natural sources, such as lightning, and emit sulfur emissions into the air through vents in the ground surface. These emissions occur both in and outside of the planning area.

[2] Those produced by living organisms.

Reasonably foreseeable actions in **Table 4-1** would continue to contribute air pollutants. Over time, an increasing population will increase vehicle use and energy requirements. State and federal regulations will continue to limit emissions, through requirements for cleaner burning fuels and through more stringent fuel standards for vehicles.

The incremental impact on air quality under all livestock grazing alternatives except Alternative B would be similar. Actions under all alternatives would have a very small incremental contribution to air pollutant emissions, compared with other sources in the decision area, planning area, and particularly upwind sources that affect local air quality.

As described in **Section 3.6**, Air Quality and Climate Change, monitoring data from 2012 to 2014 show nitrogen dioxide, PM_{10}, and $PM_{2.5}$ well below the NAAQS{ XE "National Ambient Air Quality Standards (NAAQS)" } for those pollutants; the actions proposed in this MMP{ XE "Monument Management Plan, Grand Staircase-Escalante National Monument (MMP 2000)" }-A would not affect that trend. While ozone{ XE "Ozone" } is approaching the standard for that pollutant, the actions proposed in this MMP-A would not be a significant source of ozone precursor emissions.

Under all alternatives, the BLM would implement actions to move toward meeting BLM Utah Rangeland Health{ XE "Rangeland Health" } Standards. On NPS-managed lands, additional criteria beyond BLM Utah Rangeland Health Standards may be required, as specified in the 1999 GzMP{ XE "Grazing Management Plan, Glen Canyon (GzMP 1999)" } and other NPS policies. Ongoing impacts from livestock grazing related to fugitive particulate emissions would continue to be addressed over the life of the MMP{ XE "Monument Management Plan, Grand Staircase-Escalante National Monument (MMP 2000)" }-A. Actions under all alternatives would not have a cumulative impact on air quality.

Greenhouse Gas Emissions and Carbon Storage

Past and present actions in the planning area have directly emitted greenhouse gases, and carbon has been released from soils and vegetation. Reasonably foreseeable future actions would continue this trend. Past, present, and reasonably foreseeable future actions and conditions in the cumulative impact analysis area that have contributed greenhouse gases to the atmosphere are urban development (population increases, spurring development), oil and gas development, energy production, fossil-fuel burning (primarily transportation-related use), livestock, and wildfires. The primary sources of greenhouse gas emissions on BLM-managed lands in the planning area are combustion sources, such as vehicles, construction, and maintenance equipment, enteric fermentation from domestic livestock, and occasional fires.

Individual local greenhouse gas emissions cannot be considered outside of the larger context of global cumulative emissions. The precise link between potential emissions from BLM-authorized management actions and specific impacts on or from global climate change is not known (CEQ{ XE "Council on Environmental Quality (CEQ)" } 2014). Each alternative in the MMP{ XE "Monument Management Plan, Grand Staircase-Escalante National Monument (MMP 2000)" }-A/EIS would contain actions that emit greenhouse gases and release carbon into the atmosphere, as well as actions that improve soil and vegetation conditions and thus improve carbon sinks in the area. Alternative B, which would eliminate livestock grazing, would have the

lowest greenhouse gas emissions of all alternatives; however, emissions may simply be relocated from decision area lands to other lands in the planning area.

Current scientific technology makes it difficult to link a specific BLM action to a specific climate change-related impact. Emissions of greenhouse gases from proposed BLM actions would be small in the context of broader spatial-scale emissions; the duration of most BLM actions would be shorter than predicted changes in climatic conditions. Short-term direct and indirect impacts on climate from any of the alternatives would be negligible. However, greenhouse gas emissions from actions on BLM-managed lands do contribute to total global emission levels. These, in turn, could contribute to future long-term, anticipated climate changes to a very minor degree. Overall, the contribution would be a very small portion of the total from other regional and global sources.

4.8.6 References

Bowker, M. A., J. Belnap, V. Bala Chaudhary, and N. C. Johnson. 2008. "Revisiting classic water erosion models in drylands: The strong impact of biological soil crusts{ XE "Biological Soil Crust" }." *Soil Biology and Biochemistry* 40: 2309-2016. Accessed March 23, 2016. doi: 10.1016/j.soilbio.2008.05.008.

EPA (United States Environmental Protection Agency). 2016. Draft US Greenhouse Gas Emissions Inventory Report: 1990-2014. Internet website: http://www3.epa.gov/climatechange/ghgemissions/usinventoryreport.html.

IPCC (International Panel on Climate Change). 2006. Guidelines for national greenhouse gas inventories, volume 4: agriculture, forestry and other land use. Internet website: http://www.ipcc-nggip.iges.or.jp/public/2006gl/vol4.html.

Pinno, Bradley D., and Scott D. Wilson. 2011. "Ecosystem carbon changes with woody encroachment of grassland in the Northern Great Plains." *Ecoscience* 18(2):157-163.

Manier, D. J., D. J. A. Wood, Z. H. Bowen, R. M. Donovan, M. J. Holloran, L. M. Juliusson, K. S. Mayne, et al. 2013. Summary of Science, Activities, Programs, and Policies that Influence the Rangewide Conservation of Greater Sage-Grouse{ XE "Greater Sage-Grouse" } (*Centrocercus urophasianus*). US Geological Survey Open-File Report 2013–1098. Internet website: http://pubs.usgs.gov/of/2013/1098/.

Memmott K. L., V. J. Anderson, and S. B. Monsen. 1998. "Seasonal grazing impact on cryptogamic crusts in a cold desert ecosystem." Journal of Range Management 51:547-550. 1998.

Utah Division of Air Quality. 2016. 2014 State Summary of Emissions by Source. Internet website: http://www.deq.utah.gov/ProgramsServices/programs/air/emissionsinventories/inventories/14StateList.htm.

World Resources Institute. 2014. Climate Analysis Indicators Tool: WRI's Climate Data Explorer. Washington, DC: World Resources Institute. Internet website: http://cait2.wri.org.

4.9 Fish and Wildlife

This section discusses impacts on fish and wildlife and their habitat from proposed management actions. Habitat types are described in **Section 3.2**, Vegetation. Existing conditions concerning fish and wildlife and descriptions of habitat requirements for various species are described in **Section 3.7**, Fish and Wildlife. Impacts on fish and wildlife and their habitat would constitute impacts on GSENM objects and Glen Canyon values.

4.9.1 Methods of Analysis

Potential impacts on fish and wildlife would be if anticipated future actions consistent with implementing the alternatives described in **Chapter 2**, Alternatives, were to result in any of the following:

- Disturbance to or loss of plant communities, food supplies, cover, breeding sites, and other habitat components necessary for population maintenance used by any species to a degree that would lead to substantial population declines; this includes changes in habitat that make it nonfunctional for species or more conducive to competitive species
- Disturbance to or loss of seasonally important habitat, such as that critical for overwintering or successful breeding, to a degree that would lead to substantial population declines
- Disruption of animals, including stress or interference with a species' movement pattern, that decreases the ability of a species to breed or overwinter successfully to a degree that would lead to substantial population declines
- Potential direct mortalities from motorized travel
- Impacts specific to aquatic species and their habitats
  - Increased sediment loading in waters containing sediment-intolerant fish species, loss of recruitment, stress, and habitat alteration and loss
  - Changes to habitat that make it nonfunctional for species or more conducive to competitive species
  - Reduction or elimination of streamside cover, leading to increased temperatures, stress, reduced productivity, and impacts on food webs
  - Actions that alter important water quality parameters, including pH, dissolved oxygen, temperature, turbidity, metals, and other chemical constituents
  - Loss of physical habitat, such as a reduction in water quantity, changes in water quality, sediment accumulation, habitat alteration, loss of habitat complexity, or food source reduction

In addition to the assumptions in **Section 4.1.1**, the analysis assumes the following:

- If monitoring reveals that mitigation was unsuccessful in precluding significant impacts, immediate measures to prevent further impacts would be implemented as appropriate to the species affected before the accumulation of impacts on a level of significance.
- Disturbance of a key or critical component of a species habitat would be detrimental, with the degree of detriment depending on the importance of the habitat component to the maintenance of the population.
- Wildlife habitat needs vary substantially by species; however, it is generally true that healthy and sustainable wildlife populations can be supported where there is a diverse mix of native plant communities with multiple seral stages to supply structure, forage, cover, and other specific habitat requirements. Managing for a diverse mix of native plant communities is thus an important component of managing for a diversity of species.
- Habitat conditions and quality are directly linked to the health, vigor, and cover of vegetative communities; particularly desired are those native plant communities that fish and wildlife species depend on, as well as soil conditions and water quality and quantity.
- Ground-disturbing activities could modify habitat or cause loss or gain of special status species individuals, depending on the amount of area disturbed, the nature of the disturbance, the species affected, and the location of the disturbance.
- Changes in air, water, and habitat quality could lead to direct and indirect impacts and could have cumulative impacts on species' survival.
- Impacts on populations exceeding current carrying capacity that would not reduce those populations below carrying capacity would not be considered significant.
- Impacts on terrestrial wildlife from displacement depend on the location, extent, timing, or intensity of the disruptive activity. Furthermore, impacts from displacement would be greater for wildlife species that have limited or specialized habitat or a low tolerance for disruption and disturbance. For some species, impacts from disruptive activities, such as noise impacts, may extend beyond the physical extent of the activity.
- In the context of this analysis, short-term impacts would occur over 2 years or fewer, and long-term impacts would occur over longer than 2 years. (This supersedes the definitions of short-term and long-term impacts in **Section 4.1.2**.)
- In the context of this analysis, "avoidance" means reduced use and does not imply an absence of use by wildlife.

4.9.2 Factors for Analysis

Factors for analyzing impacts on fish and wildlife are the following:

- Changes in fish and wildlife distribution, as affected by
  - Changes in acres available for livestock grazing

    - Changes in density of AUMs for livestock (acres available per AUM)
    - Allowance for or restrictions on the construction or maintenance of structural and nonstructural range improvements{ XE "Range Improvement" }
- Changes in quantity and quality of suitable fish and wildlife habitat, as affected by
    - Changes in acres available for livestock grazing
    - Changes in density of AUMs for livestock (acres available per AUM)
    - Allowance for or restrictions on the construction or maintenance of structural and nonstructural range improvements{ XE "Range Improvement" }
- Presence or absence of nuisance species, if livestock grazing and rangeland improvements could contribute to the introduction, spread, or reduction of those species, as affected by
    - Changes in acres available for livestock grazing
    - Changes in density of AUMs for livestock (acres available per AUM)
    - Allowance for or restrictions on the construction or maintenance of structural and nonstructural range improvements{ XE "Range Improvement" }

4.9.3 Nature and Type of Impacts

Impacts associated with livestock grazing management may occur from livestock use, surface disturbance related to range projects, and vegetation manipulation. In general, while livestock grazing management would play a large role in determining the extent of impacts, the more acres that are available for grazing and the higher the AUMs permitted under a given alternative, the greater the acreage that could be subject to the impacts described below to varying degrees.

Livestock grazing can have both direct and indirect impacts on fish and wildlife, including on fish and wildlife habitat, as discussed below. Livestock grazing can affect native plant communities by altering community diversity, composition, structure, and development (Popolizio et al. 1994; Vavra et al. 2007; Orodho et al. 1990). Livestock consume or alter vegetation; redistribute nutrients and plant seeds; trample soils, sagebrush, and other vegetation; and can disrupt microbiotic crusts (Belnap et al. 2001). These impacts are typically more evident and pronounced in plant communities where native grazing ungulates were not present or were present only in low densities (Bock et al. 1993; Hayward et al. 1997; Milchunas 2006). Livestock grazing can affect the habitats for wild ungulates, or big game, by altering plant biomass, species composition, and vegetation structure. Livestock and wild ungulates browse on different types of vegetation when such vegetation is available, but diet can overlap seasonally when forage availability is reduced (Chaikina and Ruckstuhl 2006; Bastian et al. 1991). Livestock presence may increase competition for forage and reduce forage efficiency for native ungulates, leading to reduced survival and reproduction in some wild ungulate species (Chaikina and Ruckstuhl 2006; Krausman et al. 2009).

Intensive livestock grazing can increase soil compaction, reduce water infiltration, decrease soil organic matter, increase soil erosion and loss, and modify nutrient cycles (Belsky and Blumenthal 1997; Bock et al. 1993; Fleischner 1994; Ingram et al. 2008; Kauffman and Krueger 1984; Milchunas 2006; Orodho et al. 1990). Soil compaction decreases vegetation cover and exposes more of the soil surface to erosion. Soil compaction may also affect the size and abundance of plants by reducing moisture availability and precluding adequate taproot penetration to deeper horizons (Ouren et al. 2007).

Furthermore, soil disturbance could increase dust, which could cover existing vegetation and impair plant photosynthesis and respiration (Tegen et al. 1996; Wijayratne et al. 2009; Zia-Khan et al. 2015) and reduce pollinator success (Lewis 2013). Resulting impacts could include lowered plant vigor and growth rate, altered or disrupted pollination, and increased susceptibility to disease, drought, and insect attack. As a result, livestock grazing could affect the density, composition, and frequency of plant species in an area, thus affecting habitat quality for fish and wildlife.

Livestock grazing can indirectly impact fish and wildlife habitat by altering weed establishment and spread. Livestock can transport weeds by passing seeds through their digestive systems or transporting seeds attached to their hair (DiTomaso 2000). Alternatively, livestock grazing can be an effective tool for weed management (Olson 1999) in some cases, resulting in improved habitat quality.

Riparian ecosystems are important for wildlife because they provide essential resources, such as breeding, wintering, and migration habitat, that are scarce or absent in the surrounding lands (Hayward et al. 1997). Livestock often use riparian areas{ XE "Riparian Area" } for water, shade, succulent vegetation, and flatter terrain (Bock et al. 1993; Hayward et al. 1997). This could impact water quality in these areas from loss of streamside vegetation, erosion, increased sedimentation and water temperature, and alterations in water chemistry, which can have negative impacts on fish and aquatic invertebrate populations (Fleischner 1994; Kauffman and Krueger 1984). Cattle waste in water bodies can decrease oxygen for fish. Furthermore, nitrites and ammonia from cattle urine and feces are chronically toxic to fish (Taylor et al. 1989). Livestock grazing could change aquatic habitat connectivity by altering bank stabilization and water quality in certain areas. Water developments near tributary creeks could affect the hydrologic regime of these systems by withdrawing water.

Changes to wildlife habitat can result in impacts on wildlife individuals or populations. Impacts are generally indirect and are due to altered habitat structure and prey availability (Fleischner 1994). Small mammal density (Reynolds and Trost 1980; Medin and Clary 1989) and diversity (Medin and Clary 1989) was reduced on grazed sites, compared with ungrazed references. Studies of reptile abundance and diversity in the desert southwest found that both metrics were higher in ungrazed reference sites (Busack and Bury 1974; Jones 1981, 1988; Szaro et al. 1985).

Fish and wildlife habitat could be affected by vegetation management for livestock forage. Vegetation manipulation includes actions designed to alter vegetation from its current state, such as nonstructural range improvements{ XE "Range Improvement" } and forage improvement. Vegetation manipulation associated with livestock grazing management would directly alter the condition of native vegetation communities by changing the density,

composition, and frequency of species in the communities. Vegetation manipulations in a given area would favor some plant species to the detriment of other species (Wagner et al. 2010), which may reduce habitat suitability for wildlife species dependent on certain plant species. Alternatively, vegetation manipulations may beneficially impact other wildlife species by resulting in additional forage availability and suitable habitat.

Range improvements{ XE "Range Improvement" }, including fences and water developments, can have indirect impacts on fish and wildlife by altering habitat. Infrastructure used for grazing, such as fences and roads, can disturb soils and encourage the establishment and spread of weeds, degrading habitat (Forman and Alexander 1998). Constructing stock ponds, guzzlers, or other infrastructure that would encourage livestock to congregate could promote vegetation loss, soil compaction, and erosion in the areas around the ponds. However, depending on the placement of stock ponds, new livestock water sources may draw livestock away from existing natural water features and sensitive riparian habitat, potentially improving habitat for fish and other riparian species. Because stock ponds are usually subject to heavy trampling and large fluctuations in water levels, they usually do not provide aquatic or riparian habitat of similar quality to natural ponds. Water developments can also impact wildlife by providing additional drinking water sources. In some instances, these can be important sources of water for wildlife.

Fences to manage livestock movement can impede wildlife movements and injure or kill birds from collisions (Stevens et al. 2012). Similarly, big game animals may become entangled while attempting to cross fences. However, fences can be designed in to mitigate but not completely eliminate these potential impacts on wildlife; for example, fences should be no more than 42 inches high, and the bottom wire should be barbless.

Roads and development have been shown to affect terrestrial wildlife, particularly big game species (Wisdom et al. 2004; Rowland et al. 2004; Trombulak and Frissell 2000). Roads used for livestock grazing management may facilitate weed spread and habitat fragmentation, resulting in reduced habitat quality for fish and wildlife species. Direct impacts on wildlife are injury or mortality from vehicle strikes and habitat avoidance. However, many roads associated with livestock management are travelled at slow speeds, reducing the likelihood of vehicles strikes in this context.

Parasites and diseases, such as respiratory diseases caused by *Pasteurellosis*, are a concern for bighorn sheep in Utah and have caused large-scale population declines (UDWR 2013). Bacteria in the Pasteurellacae family are associated with respiratory disease, death, and reduced fertility in bighorn sheep. Many mammals, including domestic sheep and goats, are carriers of these bacteria, though the disease may also be transferred among wild bighorn sheep (UDWR 2013). If native and domestic sheep come in physical contact, domestic sheep could transfer diseases, which would have negative impacts on bighorn sheep.

4.9.4 Direct and Indirect Impacts

Impacts Common to Alternatives A, C, D, and E

As discussed in **Section 1.5.3**, Planning Criteria{ XE "Planning Criteria" }, all livestock grazing management (in other words, all management actions under all alternatives but Alternative B) must use the BLM Utah Rangeland Health{ XE "Rangeland Health" } Standards. On NPS-managed

lands, additional criteria beyond BLM Utah Rangeland Health Standards may be required, as specified in the 1999 GzMP{ XE "Grazing Management Plan, Glen Canyon (GzMP 1999)" } and other NPS policies. Therefore, Alternatives A, C, D, and E must meet or make progress toward meeting the applicable standards. (Full descriptions of rangeland health standards are provided in **Chapter 2**.) There are no standards that specifically discuss fish and wildlife species; however, compliance with Standards 1 through 3 would result in habitat maintenance for fish and wildlife species.

In summary, compliance with Standard 1 would ensure that upland soils are protected from erosion, and it would support vegetation that sustains ecological function. Compliance with Standard 2 ensures that riparian and wetland{ XE "Wetland" } areas are in properly functioning condition. Compliance with Standard 3 ensures that special status species are maintained.

Upland soils and vegetation, and wetland{ XE "Wetland" } and riparian areas{ XE "Riparian Area" } are important components of fish and wildlife habitat in the planning area. Maintaining these areas in an ecologically functioning state would benefit the fish and wildlife species that use them. Similarly, maintaining special status species at appropriate levels would benefit the common fish and wildlife species that share habitat.

The BLM would continue to follow the Framework for Monitoring, Evaluation, and Adaptive Management in the MMP{ XE "Monument Management Plan, Grand Staircase-Escalante National Monument (MMP 2000)" }. Therefore, adaptive management would be incorporated into livestock grazing management under Alternatives A, C, D, and E. Continuously improving livestock grazing management by conducting rangeland health{ XE "Rangeland Health" } assessments{ XE "Rangeland Health, Assessment" } and following adaptive management principals would improve compliance with and would result in an increase in acres meeting BLM Utah Rangeland Health Standards in the planning area. This would impact fish and wildlife species, as discussed above.

Nonstructural range improvements{ XE "Range Improvement" } are not permitted in Glen Canyon, so no impacts on fish and wildlife species or populations are expected on NPS lands from these management activities.

Long-term impacts on fish and wildlife populations and distribution and on the quality and quantity of habitat can be mitigated. This would be done by implementing measures that minimize changes to habitat or restore impacts on habitat. This can include implementing water developments that discourage livestock concentration in riparian areas{ XE "Riparian Area" }, making nonstructural range improvements{ XE "Range Improvement" } in upland vegetation health and structure, and adopting noxious weed{ XE "Noxious Weed" } best management practices.

While maximum permitted AUMs vary across alternatives, the density of average actual use AUMs only varies slightly, between 49 and 52 acres available per AUM. There are 52 acres available per AUM under Alternative E, 51 acres available per AUM for Alternative A, 50 acres available per AUM for Alternative D, and 49 acres available per AUM for Alternative C.

Alternative A

Under Alternative A, current livestock grazing management would continue at existing permitted levels in the planning area. Under Alternative A, 2,089,000 acres (93 percent) are available and 153,000 acres (7 percent) are unavailable for livestock grazing. It would continue at the existing permitted level, with 76,957 active AUMs and an average actual use of 41,343 AUMs. As discussed under *Nature and Type of Impacts*, livestock grazing may affect fish and wildlife habitat by altering characteristics of vegetation, soils, and water quality. Generally, having greater acres and more AUMs allocated to livestock grazing could result in greater chances for habitat impacts. This could lead to reductions in range and distribution, decreased habitat quality, and introduction, establishment, and spread of nuisance species.

Under Alternative A, for new permits and renewals, grazing allotments will be assessed and allotment grazing plans will be developed, consistent with the BLM grazing permit{ XE "Permit, Grazing" } renewal process. As a result, allotments would maintain or continue to move toward meeting BLM Utah Rangeland Health{ XE "Rangeland Health" } Standards. Allotments meeting standards would provide superior habitat for fish and wildlife species than allotments that do not meet standards. This would result in maintenance or increases in fish and wildlife distribution and increased habitat quality.

Nonstructural range improvements{ XE "Range Improvement" } under Alternative A would continue to occur in GSENM to maintain or restore rangelands with native and nonnative species, consistent with the MMP{ XE "Monument Management Plan, Grand Staircase-Escalante National Monument (MMP 2000)" } and BLM Manual 1745 – Introduction, Transplant, Augmentation, and Reestablishment of Fish, Wildlife and Plants (BLM 1992). Under Alternative A, nonstructural range improvements would be conducted by mechanical methods such as hand pulling and using hand tools (e.g., chainsaws, machetes, and pruners), and by using machinery (e.g., roller chopping, chaining, plowing, disking) in areas that are not culturally sensitive areas.

Hand pulling and using hand tools would have fewer impacts on fish and wildlife species, compared with using machinery, which can temporarily displace wildlife due to loud noise. Under both methods, human and vehicle presence may also temporarily displace wildlife. An additional impact is wildlife mortality, due to crushing or vehicle strike for burrowing species. These impacts would last only for the duration of the treatment project and would not result in long-term wildlife avoidance or reduced range or distribution.

Prescribed fire is allowed under Alternative A in areas where fires occurred historically but where the natural fire cycle is prevented. Prescribed fires are meant to simulate natural fire intensity and timing. Since native wildlife are adapted to the types of fires that historically occurred under natural fire cycles, impacts on these species are anticipated to be limited when using prescribed fire for nonstructural range improvements{ XE "Range Improvement" }. Wildlife may be temporarily displaced from the treatment area but this impact would be short term and would not result in long-term wildlife avoidance or reduced range or distribution.

Chemical treatment methods for nonstructural range improvements{ XE "Range Improvement" } are allowed under Alternative A and are generally limited to reducing noxious weed{ XE "Noxious Weed" } cover. Due to the nature of noxious weed infestations (generally dense and discrete, as opposed to diffuse and widely distributed), chemical treatments would generally be

limited to hand spraying. This greatly reduces impacts on wildlife species, compared with other methods of chemical control. It allows wildlife to disperse from a treatment area and allows the applicator to avoid applying herbicides to nontarget vegetation and the wildlife that may be using it for cover. Wildlife may be temporarily displaced from the treatment area, but this impact would be short term and would not result in long-term wildlife avoidance or reduced range or distribution.

Generally, nonstructural range improvements{ XE "Range Improvement" } may impact wildlife species by temporarily displacing them from the treatment area. However, temporary adverse impacts would be offset by the long-term, beneficial impacts from habitat improvement that would occur as a result of nonstructural range improvements. Additionally, under Alternative A, livestock grazing is not allowed for two growing seasons following implementation of nonstructural range improvements, and potentially longer if objectives are not met. Modifying grazing to allow native seedlings to become established would result in faster progress toward improved habitat. Long-term improvements in habitat quality could allow for wildlife species to expand in distribution and would likely result in decreases in nuisance species.

Under Alternative A, the need for and extent of structural range improvements{ XE "Range Improvement" } would be considered on a case-by-case basis and identified during permit renewal, in conformance with the MMP{ XE "Monument Management Plan, Grand Staircase-Escalante National Monument (MMP 2000)" }. Fencing would be used for Monument resources. Where fencing results in increased protections for riparian and wetland{ XE "Wetland" } areas from overuse by cattle, fish and wildlife species would be impacted by the resulting improvements in habitat quality. This could increase species distribution, for example, by fish or riparian bird species recolonizing formerly degraded riparian habitat. Salt blocks and other nutritional supplements for livestock would be located away from riparian areas{ XE "Riparian Area" }, reducing impacts on riparian vegetation and riparian wildlife species.

Structural range improvements{ XE "Range Improvement" } generally result in some level of soil disturbance during installation, which can result in the impacts on fish and wildlife habitat described in *Nature and Type of Impacts*. Under Alternative A, soils management in conformance with the MMP{ XE "Monument Management Plan, Grand Staircase-Escalante National Monument (MMP 2000)" } would protect soils (including biological soil crusts{ XE "Biological Soil Crust" }) from the impacts of ground-disturbing activities. Reducing soil disturbance would impact fish and wildlife species by maintaining native vegetation cover and reducing the establishment and spread of nonnative invasive plant{ XE "Invasive Species" } species. It would also impact fish species by reducing erosion and sediment runoff into waterways. This would maintain fish and wildlife distribution and habitat quality and would reduce the introduction and spread of nuisance species.

Under Alternative A, water developments can be used as a livestock management tool when certain criteria are met. These include when water developments would have an impact on resources, including water sources and riparian areas{ XE "Riparian Area" }, and when they could be used to manage or restore native species or populations. Given the constraints on water developments, fish and wildlife would be minimally or potentially impacted. This would result in maintenance of habitat quality and distribution.

Big Game Species

Table 4-7, Livestock Grazing Allocations in Big Game Habitat by Alternative, summarizes acres that are available and unavailable to livestock grazing under each alternative and that overlie mapped habitats for big game species in the planning area.

Table 4-7
Livestock Grazing Allocations in Big Game Habitat by Alternative

Species (Habitat Type)	Allocation	Alternative A	Alternative B	Alternative C	Alternative D	Alternative E
			Bighorn Sheep			
Substantial	Available	6,600	0	5,500	6,600	6,600
Crucial	Available	695,800	0	550,700	701,000	684,100
Substantial	Unavailable	1,000	7,500	2,000	1,000	1,000
Crucial	Unavailable	75,100	776,900	226,200	75,900	84,000
			Mule Deer			
Substantial	Available	253,900	0	179,100	276,100	270,700
Crucial	Available	938,900	0	707,400	1,012,500	930,500
Substantial	Unavailable	5,300	277,600	98,400	1,500	6,800
Crucial	Unavailable	38,300	1,023,100	300,500	10,600	59,500
			Pronghorn			
Crucial	Available	85,200	0	82,000	85,200	85,200
Crucial	Unavailable	0	85,200	3,200	0	0
			Elk			
Substantial	Available	125,400	0	106,000	162,600	125,400
Crucial	Available	16,900	0	14,300	27,100	17,600
Substantial	Unavailable	29,900	168,100	55,900	5,500	36,500
Crucial	Unavailable	1,700	27,100	6,500	0	3,200

Sources: BLM GIS 2014; UDWR GIS 2015

Under Alternative A, most big game substantial and crucial habitat in the planning area would be available for livestock grazing. Where big game habitat and livestock grazing allocations overlap, big game species could be impacted by altered forage availability, competition for forage, habitat avoidance due to cattle or human presence, or habitat fragmentation due to roads, fences, or other infrastructure. The magnitude of these impacts is greatest where mule deer winter habitat coincides with an area that is available for livestock grazing. Alternatively, big game may also be impacted by increased forage availability from nonstructural range improvements**{** XE "Range Improvement" **}** and increased water availability from water developments. These impacts may result in habitat quantity and quality alterations and changes in big game distribution.

Under Alternative A, to prevent disease spread between native and domestic sheep, no allotments within 9 miles of bighorn sheep habitat will be converted to domestic sheep, unless topographic barriers would ensure that there would be no physical contact between the species.

There are no allotments in the GSENM where sheep or goats graze, and there are no plans to convert any allotments to sheep or goats. Therefore, disease transmission impacts on native bighorn sheep populations in the planning area are not anticipated under Alternative A.

Alternative B

Under Alternative B, no acres and no AUMs would be available for livestock grazing, since livestock grazing would be discontinued in the decision area. Impacts on fish and wildlife species and habitat could occur from removing structural range improvements{ XE "Range Improvement" } and restoring nonstructural range improvements, consistent with the MMP{ XE "Monument Management Plan, Grand Staircase-Escalante National Monument (MMP 2000)" }. These impacts would be similar to those described in Alternative A; however, the extent and duration of impacts would be greatly reduced, compared with Alternative A.

Alternative C

Under Alternative C, 1,619,700 acres (72 percent) would be available for livestock grazing and 622,300 acres (28 percent) would be unavailable for livestock grazing. There would be 63,144 active AUMs, with a projected average actual use of 33,368 AUMs. These allocations represent a 23 percent decrease in available acres and an 18 percent decrease in active AUMs, compared with Alternative A. Reductions in acres available to grazing under Alternative C would result, in part, from Alternative C's emphasis on large, ungrazed reference areas.

For most fish and wildlife species and habitats, maintaining large, ungrazed reference areas under Alternative C would result in reduced impacts, relative to Alternative A. Additionally, where fencing is required to exclude livestock from a reference area, impacts on wildlife as described under *Nature and Type of Impact* may occur, such as restricted movement of wildlife and injury or death of wildlife resulting from collision or entanglement with fencing.

Under Alternative C, livestock grazing management would follow current regulations and policies, including those at 43 CFR, Part 4100, and the BLM Utah Rangeland Health{ XE "Rangeland Health" } Standards. As a result, allotments would maintain or continue to move toward meeting BLM Utah Rangeland Health Standards. Allotments meeting standards would provide superior habitat for fish and wildlife species than allotments that do not meet standards. This would result in maintenance or increases in fish and wildlife distribution and increased habitat quality, as described for Alternative A.

For permit renewal under Alternative C, the BLM would consider changing seasons of use, duration, distribution, and stocking rates{ XE "Stocking Rate" }. This would reduce conflicts where livestock grazing overlaps with special designation areas, such as WSAs, research natural areas, and wild and scenic river segments. Modifying permit conditions to reduce management conflicts in these areas would have incidental reductions in impacts on fish and wildlife habitat in these areas. As a result, impacts would be reduced, relative to Alternative A.

Nonstructural range improvements{ XE "Range Improvement" } under Alternative C would occur in GSENM to maintain or restore rangelands, consistent with the MMP{ XE "Monument Management Plan, Grand Staircase-Escalante National Monument (MMP 2000)" } and BLM Manual 1745. However, under Alternative C, native species, as opposed to native and nonnative species in Alternative A, would be used for restoration. Also, passive restoration and non-

chemical methods would be the priority for preventing the introduction, establishment, and spread of noxious weeds{ XE "Noxious Weed" } and nonnative invasive species{ XE "Invasive Species" }. Passive restoration approaches alone may not improve habitats that are degraded by annual grasses or prevent further spread of nonnative invasive plant species (McIver and Starr 2001). However, planning area lands would still be managed with the overall objective of maintaining, restoring, or enhancing vegetation, consistent with the MMP and BLM Manual 1745. Because of this, passive restoration would not be used in areas invaded by annual grasses, because it would likely not be effective in achieving this objective. As a result, impacts on fish and wildlife and habitat would be reduced, compared with Alternative A, because nonstructural range improvements incidentally improve fish and wildlife habitat.

Other nonstructural range improvements{ XE "Range Improvement" } under Alternative C—mechanical methods, machinery, chemical treatments (for objectives other than weed reduction), and prescribed fire—would be conducted by the same methods as described under Alternative A. These management actions would result in the same impacts on fish and wildlife habitat and populations as those described under Alternative A.

Under Alternative C, the need for and extent of structural range improvements{ XE "Range Improvement" } would be assessed in a similar manner as that described under Alternative A. However, structural range improvements could also be considered to meet the objectives in this MMP{ XE "Monument Management Plan, Grand Staircase-Escalante National Monument (MMP 2000)" }-A. Impacts on fish and wildlife species from water developments would be the same as those described under Alternative A. Impacts on wildlife species from fencing would also be the same as those described under Alternative A.

Salt blocks and other nutritional supplements for livestock would be located away from riparian areas{ XE "Riparian Area" } and areas with a high cover of biological soil crusts{ XE "Biological Soil Crust" } or soils with high degradation potential. This would result in less soil erosion and sedimentation into waterways, improving habitat quality for fish species, relative to Alternative A.

Under Alternative C, soils management in conformance with the MMP{ XE "Monument Management Plan, Grand Staircase-Escalante National Monument (MMP 2000)" } would protect soils from ground-disturbing structural range improvements{ XE "Range Improvement" }, as described under Alternative A. However, under Alternative C, soils protections would be extended to areas with high cover of biological soil crusts{ XE "Biological Soil Crust" }, soils with high biodiversity value, such as gypsiferous soils, and soils susceptible to degradation. Extended protections would result in fewer acres of soil disturbance associated with structural range improvements. Impacts would be similar to those described under Alternative A; however, because soil disturbance would be reduced, impacts on fish and wildlife would be reduced under Alternative C.

Big Game Species

Under Alternative C, acres of big game habitat available to livestock grazing would be reduced, and acres of big game habitat unavailable for livestock grazing would be increased, relative to Alternative A (**Table 4-7**, Livestock Grazing Allocations in Big Game Habitat by Alternative). This would result in fewer impacts on big game habitat, relative to Alternative A, in turn

resulting in increased habitat quantity and quality and increased big game species distribution. Conversely, fewer nonstructural range improvements{ XE "Range Improvement" } and water developments in big game habitat may reduce forage and water availability somewhat, limiting improvements in habitat quantity and quality and big game distribution.

Because only cattle and horses (not domestic sheep) would be grazed in the planning area, disease transmission impacts on native bighorn sheep populations are not anticipated under Alternative C.

Alternative D

Under Alternative D, 2,135,200 acres (95 percent) would be available for livestock grazing, and 106,800 acres (5 percent) would be unavailable for livestock grazing. There would be 107,955 active AUMs. These allocations represent a 2 percent increase in available acres and a 40 percent increase in active AUMs, compared with Alternative A.

Under Alternative D, livestock grazing management would follow current regulations and policies, including those at 43 CFR, Part 4100, and the BLM Utah Rangeland Health{ XE "Rangeland Health" } Standards. As a result, allotments would maintain or continue to move toward meeting BLM Utah Rangeland Health Standards. Allotments meeting standards would provide superior habitat for fish and wildlife species than allotments that do not meet standards. This would maintain or increase fish and wildlife distribution and would increase habitat quality, generally having the same impacts as described under Alternative A.

Nonstructural range improvements{ XE "Range Improvement" } under Alternative D would continue to occur in GSENM, as described under Alternative A. However, under Alternative D, both native and nonnative species may be used to optimize forage in nonstructural range improvements. Allowing the use of nonnative plant species would restore areas with a lower cover of native species. This would likely have different impacts on wildlife, depending on the species; those species requiring a high cover of native plants to complete their life cycle may be negatively impacted to a greater extent than Alternative A, while habitat generalists or those that may browse on nonnative species may be impacted by increased forage availability, relative to Alternative A.

Under Alternative D, nonstructural range improvements{ XE "Range Improvement" } would be conducted by all available and appropriate treatment measures, in compliance with BLM Manual 9011, Chemical Pest Control, or current guidance, including aerial herbicide treatment. Additionally, chemical control would not be limited to noxious weed{ XE "Noxious Weed" } treatments but could be used for sagebrush thinning and brush control. Prescribed fires would be used for brush, pinyon, and juniper control and would not be limited to areas that have burned historically, as under Alternative A. Additional management action under Alternative D is to rest treatment areas from livestock grazing for two growing seasons or until the site objectives are met.

Impacts on wildlife species resulting from nonstructural range improvements{ XE "Range Improvement" } would generally be greater under Alternative D than under Alternative A. This would be due to treating greater areas with methods that may temporarily disturb wildlife, such as aerial herbicide application, and expanding the role of prescribed fire, compared with

Alternative A. As described above, using nonnative species in nonstructural range improvements would result in adverse impacts on some wildlife species; however, other wildlife species would be beneficially impacted by increased forage availability, compared with Alternative A.

Under Alternative D, the need for and extent of structural range improvements{ XE "Range Improvement" } would be assessed, as described under Alternative C. Impacts on fish and wildlife from water developments, fencing, and salt blocks and other supplements would be the same as those described under Alternative A.

Alternative D contains fewer protections for soil resources than does Alternative A. Therefore, the impacts on fish and wildlife species from soil-disturbing activities described under the *Nature and Type of Impacts* would be greater than under Alternative A. Under Alternative D, such impacts would reduce fish and wildlife habitat quality and distribution. Impacts would also increase the introduction and spread of nuisance species, relative to Alternative A.

Big Game Species

Under Alternative D, acres of big game habitat available to livestock grazing would generally be the same or slightly increased, and acres of big game habitat unavailable to livestock grazing would generally be slightly reduced, relative to Alternative A (**Table 4-7**, Livestock Grazing Allocations in Big Game Habitat by Alternative). This would result in greater impacts on big game habitat, relative to Alternative A, in turn, resulting in decreased habitat quantity and quality and decreased big game species distribution. Conversely, nonstructural range improvements{ XE "Range Improvement" } and water developments in big game habitat under Alternative D may increase forage and water availability somewhat, resulting in improved habitat quantity and quality and big game distribution.

Impacts on native bighorn sheep from disease transmission would be the same as described under Alternative C.

Alternative E

Under Alternative E, 2,065,300 acres (92 percent) would be available for livestock grazing and 176,700 acres (7 percent) would be unavailable for livestock grazing. There would be 76,520 active AUMs. These allocations represent a 1 percent decrease in available acres and a 1 percent decrease in active AUMs, compared with Alternative A.

Under Alternative E, livestock grazing management and resulting impacts would be the same as those described under Alternative D.

For permit renewal under Alternative E, the BLM would consider changing seasons of use, duration, distribution, and stocking rates{ XE "Stocking Rate" }, as described under Alternative C. Impacts would be the same as those described under Alternative D.

Nonstructural range improvements{ XE "Range Improvement" } under Alternative E would continue to occur in GSENM to maintain or restore rangelands with native and nonnative species, consistent with BLM Manual 1745. Under Alternative E, nonstructural range improvements would be conducted by all available and appropriate treatment measures, in compliance with BLM Manual 9011, Chemical Pest Control, and current guidance, as described

for Alternative D. Impacts would be the same as those described under Alternative D; however, Alternative E emphasizes and perpetuates native seed use in nonstructural range improvements. Seed species would be based on availability, adaptation (ecological site{ XE "Ecological Site" } potential), and probability of success. Emphasizing native seed use would provide impacts by improving habitat quality in the long term, relative to Alternative A.

Under Alternative E, the need for and extent of structural range improvements{ XE "Range Improvement" } would be assessed, as described under Alternative D. Impacts on fish and wildlife species from water developments and fencing would be the same as those described under Alternative A. Salt blocks and other nutritional supplements for livestock would be located away from riparian areas{ XE "Riparian Area" } and from areas with a high cover of biological soil crusts{ XE "Biological Soil Crust" } or soils with high degradation potential. This would result in less soil erosion and sedimentation into waterways, improving habitat quality for fish species, relative to Alternative A.

Under Alternative E, soils management in conformance with the MMP{ XE "Monument Management Plan, Grand Staircase-Escalante National Monument (MMP 2000)" } would protect soils from ground-disturbing structural range improvements{ XE "Range Improvement" }, as described under Alternative A. However, soils protections would be extended to areas with high cover of biological soil crusts{ XE "Biological Soil Crust" }, soils with high biodiversity value, such as gypsiferous soils, and soils susceptible to degradation. Impacts would be reduced, relative to Alternative A.

Big Game Species

Under Alternative E, acres of big game habitat available to livestock grazing would be slightly reduced. Acres of big game habitat unavailable to livestock grazing would be slightly increased, relative to Alternative A (**Table 4-7**, Livestock Grazing Allocations in Big Game Habitat by Alternative). This would result in fewer detrimental impacts on big game habitat, relative to Alternative A, in turn resulting in increased habitat quantity and quality and increased big game species distribution.

Impacts on native bighorn sheep from disease transmission would be the same as described under Alternative C.

4.9.5 Cumulative Impacts

The cumulative impacts analysis area for fish and wildlife varies by species. Analysis areas for terrestrial species are composed of game management units that intersect the planning area. For aquatic species, the cumulative impacts analysis area is the same as the cumulative impacts analysis area for water resources, extending outside the planning area and following watershed boundaries that completely or partially overlap it. For migratory birds, the cumulative impacts analysis area includes the planning area.

Cumulative impacts on fish and wildlife are related to those described for vegetation. This is because vegetation communities provide habitat for wildlife and can affect habitat for fish (e.g., riparian vegetation).

The following is a list of past, present, and reasonably foreseeable future actions and conditions in the cumulative impacts analysis area (see **Table 4-1**), both on public and private land, which have affected and will likely continue to affect fish and wildlife:

- Other federal, state, and county land use planning efforts
- Livestock grazing management
- Fish and wildlife and special status species management
- Vegetation and noxious weed**{** XE "Noxious Weed" **}** management
- Recreation and visitor use
- Lands and realty actions
- Infrastructure-scale water developments
- Wildfire
- Drought
- Climate change**{** XE "Climate Change" **}**

Many of these activities change habitat conditions, which then cause or favor other habitat changes. For example, wildfire removes habitat, and affected areas are then more susceptible to weed invasion, soil erosion, and sedimentation of waterways, all of which degrade habitats. In general, resource use activities have cumulatively caused habitat removal, fragmentation, noise, increased human presence, and weed spread; conversely, land planning efforts and vegetation, habitat, and weed treatments have countered these impacts by improving habitat connectivity, productivity, diversity, and health.

Climate change**{** XE "Climate Change" **}** could increase or decrease temperatures and alter precipitation patterns. This would affect soil conditions, vegetation distribution, and water flows, quality, and temperature (Lenihan et al. 2003; McKenney et al. 2007; Hamann and Wang 2006; Eaton and Scheller 1996). Riparian and wetland**{** XE "Wetland" **}** areas would be affected by reduced high-elevation winter snowpack, modified low-elevation precipitation amounts and timing, and the associated changes in flow regimes. Such changes would alter habitat conditions, potentially creating conditions that could favor certain species or communities, weeds, or pests (Hellmann et al. 2007).

Under the MMP**{** XE "Monument Management Plan, Grand Staircase-Escalante National Monument (MMP 2000)" **}**-A alternatives, impacts on fish and wildlife would be minimized to the extent practicable and feasible. This would come about through restrictions and stipulations on livestock grazing management and by following relevant BLM and NPS management documents. Habitat conditions would be improved through nonstructural range improvements**{** XE "Range Improvement" **}**, structural improvements that are protective of riparian habitat, and weed prevention and control.

Under the MMP**{** XE "Monument Management Plan, Grand Staircase-Escalante National Monument (MMP 2000)" **}**-A alternatives, the BLM and NPS would work toward achieving BLM Utah Rangeland Health**{** XE "Rangeland Health" **}** Standards in GSENM and Glen Canyon. On

NPS-managed lands, additional criteria beyond BLM Utah Rangeland Health Standards may be required, as specified in the 1999 GzMP{ XE "Grazing Management Plan, Glen Canyon (GzMP 1999)" } and other NPS policies. However, the alternatives would differ in the time and methods used to reach that goal. Fish and wildlife habitat conditions would be improved through grazing management, vegetation treatments{ XE "Vegetation Treatment" }, structural and nonstructural range improvements{ XE "Range Improvement" }, and weed prevention and control measures. As a result, the incremental contribution of the MMP-A alternatives to cumulative impacts on fish and wildlife is expected to be minor.

4.9.6 References

Bastian, C. T., J. J. Jacobs, L. J. Held, and M. A. Smith. 1991. "Multiple use of public rangeland: Antelope and stocker cattle in Wyoming." *Journal of Range Management* 44(4):390-394.

Belnap, J., J. H. Kaltenecker, R. Rosentreter, J. Williams, S. Leonard, and D. Eldridge. 2001. Biological soil crusts{ XE "Biological Soil Crust" }: Ecology and management. Technical Reference 1730-2. US Department of the Interior, Bureau of Land Management, Denver, Colorado.

Belsky, A. J., and D. M. Blumenthal. 1997. "Effects of livestock grazing on stand dynamics and soils in upland forest of the interior west." *Conservation Biology* 11(2):315-327.

Bock, C. E., V. A. Saab, T. D. Rich, and D. S. Dobkin. 1993. "Effects of livestock grazing on neotropical migratory landbirds in western North America." In: Status and Management of Neotropical Migratory Birds (D. M. Finch and P. W. Stangel, editors). US Department of Agriculture, Forest Service, Rocky Mountain Forest and Range Experiment Station, General Technical Report RM-229. Fort Collins, Colorado. Pp. 296-309.

BLM (United States Department of the Interior, Bureau of Land Management). 1992. Manual 1745, Introduction, Transplant, Augmentation, and Reestablishment of Fish, Wildlife, and Plants. BLM, Washington, DC. March 26, 1992.

BLM GIS. 2014. Base GIS data on file with the BLM's eGIS server used for calculations or figures to support the MMP{ XE "Monument Management Plan, Grand Staircase-Escalante National Monument (MMP 2000)" }-A. BLM, Grand Staircase Escalante National Monument, Utah.

Busack, S. D., and R. B. Bury. 1974. "Some effects of off-road vehicles and sheep grazing on lizard populations in the Mojave Desert." *Biological Conservation* 6:179-183.

Chaikina, N. A., and K. E. Ruckstuhl. 2006. "The effect of cattle grazing on native ungulates: The good, the bad, and the ugly." *Rangelands* 28(3):8-14.

DiTomaso, J. M. 2000. "Invasive weeds in rangelands: Species, impacts, and management." *Weed Science* 48(2):255-265.

Eaton, J. G., and R. M. Scheller. 1996. "Effects of climate warming on fish thermal habitat in streams of the United States." *Limnology and Oceanography* 41(5):1109-1115.

Forman, R. T., and L. E. Alexander. 1998. “Roads and their major ecological effects.” *Annual Review of Ecology and Systematics* 29:207-231.

Fleischner, T. L. 1994. “Ecological costs of livestock grazing in western North America.” *Conservation Biology* 8(3):629-644.

Hayward, B., E. J. Heske, and C. W. Painter. 1997. “Effects of livestock grazing on small mammals at a desert cienega.” *Journal of Wildlife Management* 61(1):123-129.

Hamann, A., and T. Wang. 2006. “Potential effects of climate change on ecosystem and tree species distribution in British Columbia.” *Ecology* 87(11):2773-2786.

Hellmann, J. J., J. E. Byers, B. G. Bierwagen, and J. S. Dukes. 2007. “Five potential consequences of climate change for invasive species{ XE "Invasive Species" }.” *Conservation Biology* 22(3):534-543.

Ingram, L. J., P. D. Stahl, G. E. Schuman, J. S. Buyer, G. F. Vance, G. K. Ganjegunte, J. M. Welker, and J. D. Derner. 2008. “Grazing impacts on soil carbon and microbial communities in a mixed-grass ecosystem.” *Soil Science Society of America Journal* 72(4):939-948.

Jones, K B. 1981. “Effects of grazing on lizard abundance and diversity in western Arizona.” *Southwestern Naturalist* 26:107-115.

_____. 1988. “Comparison of herpetofaunas of a natural and altered riparian ecosystem.” In Management of amphibians, reptiles, and small mammals in North America. General Technical Report RM-166 (R. C. Szaro, K. E. Severson, and D. R. Patton, Technical Coordinators). US Forest Service, Rocky Mountain Forest and Range Experiment Station, Fort Collins, Colorado. Pp. 222-227

Kauffman, J. B., and W. C. Krueger. 1984. “Livestock impacts on riparian ecosystems and streamside management implications: A review.” *Journal of Range Management* 37(5):430-438.

Krausman, P. R., D. E. Naugle, M. R. Frisina, R. Northrup, V. C. Bleich, W. M. Block, M. C. Wallace, and J. D. Wright. 2009. “Livestock grazing, wildlife habitat, and rangeland values.” *Rangelands* 31(5):15-19.

Lenihan, J. M., R. Draypek, D. Bachelet, and R. P. Neilson. 2003. “Climate change{ XE "Climate Change" } effects on vegetation distribution, carbon, and fire in California.” *Ecological Applications* 13(6):1667-1681.

Lewis, M. B. 2013. “Roads and the reproductive ecology of *Hesperidanthus suffrutecens*, an endangered shrub.” Master’s thesis. Utah State University, Logan.

McKenney, D. W., J. H. Pedlar, K. Lawrence, K. Campbell, and M. F. Hutchinson. 2007. “Potential impacts of climate change on the distribution of North American trees.” *BioScience* 57(11):939-948.

McIver, J., and L. Starr. 2001. "Restoration of degraded lands in the interior Columbia River basin: Passive vs. active approaches." *Forest Ecology and Management* 153:15-28.

Medin, D. E., and W. P. Clary. 1989. "Small mammal populations in a grazed and ungrazed riparian habitat in Nevada." Research Paper INT-413. US Forest Service, Intermountain Research Station, Ogden, Utah.

Milchunas, D. G. 2006. Responses of plant communities to grazing in the southwestern United States. US Department of Agriculture, Forest Service, Rocky Mountain Research Station, General Technical Report RMRS-GTR-169. Fort Collins, Colorado.

Olson, B. E. 1999. "Grazing and weeds." In: *Biology and Management of Noxious Rangeland Weeds* (R. L. Sheley and J. K. Petroff, editors). Oregon State University Press. Corvallis. Pp. 85-96.

Orodho, A. B., M. J. Trlica, and C. D. Bonham. 1990. "Long-term heavy-grazing effects on soil and vegetation in the Four Corners Region." *The Southwestern Naturalist* 35(1): 9-14.

Ouren, D. S., Christopher Haas, C. P. Melcher, S. C. Stewart, P. D. Ponds, N. R. Sexton, Lucy Burris, et al. 2007. Environmental Effects of Off-Highway Vehicles on Bureau of Land Management Lands: A Literature Synthesis, Annotated Bibliographies, Extensive Bibliographies, and Internet Resources. US Geological Survey, Open-File Report 2007-1353.

Popolizio, C. A., H. Goetz, and P. L. Chapman. 1994. "Short-term response of riparian vegetation to 4 grazing treatments." *Journal of Range Management* 47(1):48-53.

Reynolds, T. D., and C. H. Trost. 1980. "The response of native vertebrate populations to crested wheatgrass planting and grazing by sheep." *Journal of Range Management* 33:122-125.

Rowland, M. M., M. J. Wisdom, B. K. Johnson, and M. A. Penninger. 2004. "Effects of roads on elk: Implications for management in forested ecosystems." *In:* Transactions of the 69th North American Wildlife and Natural Resources Conference. Wildlife Management Institute, Washington, DC. Pp. 491-508.

Stevens, B. S., K. P. Reese, J. W. Connelly, and D. D. Musil. 2012. "Greater sage-grouse{ XE "Greater Sage-Grouse" } and fences: Does marking reduce collisions?" *Wildlife Society Bulletin* 36:297-303.

Szaro, R. C., S. C. Belfit, J. K. Aitkin, and J. N. Rinne. 1985. "Impact of grazing on a riparian garter snake." In "Riparian ecosystems and their management: Reconciling conflicting uses." General Technical Report RM-120 (R. R. Johnson, C. D. Ziebell, D. R. Patton, and F. H. Hamre, Technical Coordinators). US Forest Service, Rocky Mountain Forest and Range Experiment Station, Fort Collins, Colorado. Pp. 359-363.

Taylor, F. R., L. A. Gillman, L. P. Gillman, and J. W. Pedretti. 1989. "Impact of cattle on two isolated fish populations in Pahranagat Valley, Nevada." *The Great Basin Naturalist* 49(4):491-495. October 31, 1989.

Trombulak, S. C., and C. A. Frissell. 2000. "Review of ecological effects of roads on terrestrial and aquatic communities." *Conservation Biology* 14 (1):18-30.

Tegen, I., A. A. Lacis, and I. Fung. 1996. "The influence on climate forcing of mineral aerosols from disturbed soils." *Nature* 380:419-422.

UDWR (Utah Division of Wildlife Resources). 2013. Utah Bighorn Sheep Statewide Management Plan. Salt Lake City, Utah.

UDWR GIS. 2015. GIS data of mammal habitat coverages in Utah. Internet website: http://dwrcdc.nr.utah.gov/ucdc/DownloadGIS/disclaim.htm.

Vavra, M. 2005. "Livestock grazing and wildlife: Developing compatibilities." *Rangeland Ecology and Management* 58(2):128-134.

Wagner, J., P. Biggam, M. Martin, and B. Bobowski. 2005. An Assessment of Riparian and Upland Conditions on Grazing Allotments at Lake Roosevelt National Recreation Area, Washington. Technical Report NPS/NRWRD/NRTR-2005/329. April 2005.

Wijayratne, U. C., S. J. Scoles-Sciulla, and L. A. Defalco. 2009. "Dust deposition effects on growth and physiology of the endangered *Astragalus jaegerianus* (Fabaceae)." *Madrono* 56:81-88.

Wisdom, M. J., A. A. Ager, H. K. Preisler, N. J. Cimon, and B. K. Johnson. 2004. "Effects of off-road recreation on mule deer and elk." *In:* Transactions of the 69th North American Wildlife and Natural Resources Conference. Wildlife Management Institute, Washington, DC. Pp. 531-550.

Zia-Khan, S., W. Spreer, Y. Pengnian, X. Zhao, H. Othmanli, X. He, and J. Muller. 2015. "Effect of dust deposition on stomatal conductance and leaf temperature of cotton in northwest China." *Water* 7:116-131.

4.10 SPECIAL STATUS SPECIES

On BLM- and NPS-managed lands in the decision area, the agencies are directly responsible for managing habitat for special status species; they are indirectly responsible for the health of special status species that these habitats support. This section discusses impacts on federally listed species, BLM sensitive species, and state-listed species from proposed management actions. Existing conditions are described in **Section 3.8**, Special Status Species. Impacts on special status species and their habitat would constitute impacts on GSENM objects and Glen Canyon values and purposes.

4.10.1 Methods of Analysis

Although data on known locations and habitats within the decision area are available, the data are neither complete nor comprehensive concerning all known special status species occurrences and potential habitat that might exist. Known and potential special status species and habitat locations were considered in the analysis; however, the potential for species to occur outside of these areas was also considered and, as a result, some impacts are discussed in more general terms.

Potential impacts on special status species could occur if anticipated future actions consistent with implementing the alternatives described in **Chapter 2** were to result in any of the following:

- Disturbance to or loss of plant communities, food supplies, cover, breeding sites, and other habitat components necessary for population maintenance used by any special status species to a degree that would lead to substantial population declines
- Disturbance to or loss of proposed or designated critical habitat, where it exists in the planning area
- Disturbance to or loss of seasonally important habitat (e.g., critical for overwintering or successful breeding) to a degree that would lead to substantial population declines for any special status species
- Disruption of special status wildlife species, including stress or interference with a species' movement pattern that decreases its ability to breed or overwinter successfully to a degree that would lead to substantial population declines
- Cause impacts specific to special status plant species and their habitats
  - Damage to or loss of individual special status plants or seed banks
  - Degradation of habitat through soil-disturbing activities
  - Loss of or decrease in special status plant pollinators
- Cause impacts specific to aquatic special status species and their habitats
  - Increased sediment loading in waters containing sediment-intolerant special status fish species, loss of recruitment, stress, habitat alteration, and habitat loss
  - Changes to habitat that make it nonfunctional for special status species or more conducive to competitive species
  - Reduction or elimination of streamside cover, leading to increased temperatures, stress, reduced productivity, and impacts on food webs
  - Actions that alter important water quality parameters, including pH, dissolved oxygen, temperature, turbidity, metals, and other chemical constituents
  - Loss of physical habitat (e.g., water quantity), changes in water quality, sediment accumulation, habitat alteration, loss of habitat complexity, and food source reduction

In addition to the assumptions in **Section 4.1.1**, the analysis assumes the following:

- Under all alternatives, no decision would be approved or authorized on BLM- or NPS-managed lands that would jeopardize the continued existence of special status species that are listed as threatened, endangered, or proposed or candidates for listing as threatened or endangered. Implementation of the special status species program is directed at preventing the need for listing proposed or candidate species under the ESA**{** XE "Endangered Species Act (ESA)" **}**, protecting special status species, and improving their habitats to a point where their special status recognition is no longer warranted.
- Consultation with the USFWS under Section 7 of the ESA**{** XE "Endangered Species Act (ESA)" **}** would be undertaken for any actions that have the potential to affect federally listed species.
- Ground-disturbing activities could modify habitat or cause loss or gain of special status species individuals, depending on the amount of area disturbed, the nature of the disturbance, the species affected, and the location of the disturbance.
- Changes in air, water, and habitat quality could lead to direct and indirect impacts and could have cumulative impacts on species survival.
- For implementation-level actions subject to further environmental review, including NEPA**{** XE "National Environmental Policy Act (NEPA)" **}**, as appropriate, additional field inventories would likely be needed to determine presence or absence of special status species in the project area.
- Short-term impacts are defined as those that would occur over 2 years or less and long-term impacts would occur over longer than 2 years. (This supersedes the definitions of short-term and long-term impacts in **Section 4.1.2**.)
- Generally, assumptions listed in **Section 4.9**, Fish and Wildlife, also apply to special status fish and wildlife species.

4.10.2 Factors for Analysis

Factors for analysis of impacts on special status species are the following:

- Potential to meet Standard 3 from the BLM Utah Rangeland Health**{** XE "Rangeland Health" **}** Standards, as affected by
  - Changes in acres available for livestock grazing
  - Changes in AUMs allocated for livestock
  - Changes in density of AUMs for livestock (acres available per AUM)
  - Allowance for or restrictions on the construction or maintenance of new structural and nonstructural range improvements**{** XE "Range Improvement" **}**

On NPS-managed lands, additional criteria beyond BLM Utah Rangeland Health{ XE "Rangeland Health" } Standards may be required, as specified in the 1999 GzMP{ XE "Grazing Management Plan, Glen Canyon (GzMP 1999)" } and other NPS policies.

4.10.3 Nature and Type of Impacts

Special status species and their habitats on decision area lands would be affected under all alternatives. In general, the nature and type of impacts on special status species would be similar to those on fish and wildlife species, as described in **Section 4.9**, Fish and Wildlife. However, impacts on special status species may be of more consequence, as these species typically exhibit limited distributions and relatively low population numbers, compared with common fish and wildlife species. In general, while livestock grazing management would play a large role in determining the extent of impacts, the more acres that are available for grazing and the higher the AUMs permitted under a given alternative, the greater the acreage that could be subject to the impacts listed below to varying degrees.

Special Status Wildlife

Three general categories of impacts are anticipated to be the most influential on special status wildlife species and their habitat: habitat alteration, fragmentation, and loss; displacement; and habitat enhancement.

Habitat alteration, fragmentation, and loss

Surface-disturbing activities, including from structural range improvements{ XE "Range Improvement" }, can cause habitat alteration, fragmentation, and loss, depending on the type, amount, and location of the activity. Habitat becomes fragmented when a contiguous habitat is broken up by surface-disturbing activities, causing a reduction in usable ranges; disruption of movements among habitats, transitional areas, and breeding areas; isolation of smaller, less mobile species; and increase in habitat generalists that are characteristic of disturbed environments (Harris 1991).

Livestock grazing can directly and indirectly impact habitat for special status species. Livestock grazing can reduce wildfire severity by reducing fuel loading over the short and long terms (Davies et al. 2010), which can help prevent habitat degradation from catastrophic wildfire. However, improper grazing can directly and indirectly contribute to habitat degradation, through weed invasion, perennial{ XE "Perennial" } bunchgrass loss, increased bare ground and erosion, increased fuel loads, and altered fire regimes (DiTomaso 2000; Frost and Launchbaugh 2003; Reisner et al. 2013; Davies et al. 2010). These types of impacts would occur over the long term. Managing grazing to the BLM Utah Rangeland Health{ XE "Rangeland Health" } Standards (BLM 1997) would prevent or minimize these impacts.

Livestock use in riparian areas{ XE "Riparian Area" } for water, shade, succulent vegetation, and flatter terrain (Bock et al. 1993; Hayward et al. 1997) may impact riparian vegetation through trampling, leading to reduced plant vigor and soil compaction (Belsky et al. 1999). This could impact water quality in these areas from loss of streamside vegetation, erosion, increased sedimentation and water temperature, and alterations in water chemistry, which can have negative impacts on fish populations (Fleischner 1994; Kauffman and Krueger 1984). Cattle waste in water bodies can decrease oxygen for fish. Furthermore, nitrites and ammonia from cattle urine and feces are chronically toxic to fish (Taylor et al. 1989). Exposed soils cause more

runoff and increase the likelihood of streambank erosion. Higher runoff and erosion could lead to increased sediment loading, which in turn could lead to increased turbidity, lower dissolved oxygen, and increased temperature in waterways occupied by special status fish. Excluding livestock grazing from riparian areas would help the areas maintain vegetation height, cover, and vigor (Sarr 2002), potentially increasing habitat suitability for special status fish species.

Altering vegetation communities can alter habitat for wildlife species. By removing or altering vegetation, livestock grazing can reduce food and cover, thermal protection, and nesting and brood-rearing sites for greater sage-grouse{ XE "Greater Sage-Grouse" } (Connelly et al. 2004; Knick et al. 2011; Manier et al. 2013).

As described in **Section 4.9**, Fish and Wildlife, structural range improvements{ XE "Range Improvement" }, such as fences, may lead to increased wildlife mortality. This may benefit California condors by providing increased carcasses for forage along fence lines.

Displacement

The presence of livestock or noise from livestock grazing management, including vehicles or noise generated during structural or nonstructural range improvements{ XE "Range Improvement" }, could disturb and displace special status species during sensitive periods. This may indirectly affect reproduction or cause species to abandon areas, such as nest sites. Stress inflicted on special status species from noise disturbance could also cause species' health to deteriorate and affect survival. Chronic or continuous disturbance could result in reduced fitness, reproductive potential, and abandonment of young (Geist 1978).

Enhancement

Though nonstructural range improvements{ XE "Range Improvement" } would not be implemented for the express purpose of enhancing special status species habitat, some special status species may nonetheless benefit from increased habitat quality resulting from these projects. California condors may benefit from the additional carcasses for forage provided by dead cattle in areas available to livestock grazing.

Special Status Plants

The nature and type of impacts resulting from livestock grazing that may be most likely to affect special status plant species are those impacts from ground-disturbing activities. Ground-disturbing activities may result in loss of individuals or occurrences, reduced reproductive success, and reduced habitat quality, all of which may affect special status plant species, as discussed below.

Loss of individuals or occurrences

Ground-disturbing activities resulting from livestock grazing or structural or nonstructural range improvements{ XE "Range Improvement" } could result in direct impacts on special status plants via mortality or mechanical damage to individual plants when activities occur within populations.

Reduced reproductive success

Ground-disturbing activities may not always result in plant mortality. However, mechanical damage from herbivory or trampling on special status plants can result in reduced plant vigor, which could reduce reproductive success. Ground-disturbing activities may facilitate noxious

weed{ XE "Noxious Weed" } or invasive plant{ XE "Invasive Species" } encroachment, increasing competition for resources and leading to reduced reproductive success for special status plants. Soil disturbance may generate fugitive dust (Tegen et al. 1996), which may settle on special status plants, slowing plant photosynthesis (Wijayratne et al. 2009; Zia-Khan et al. 2015) and reducing pollinator success (Lewis 2013). Ground-disturbing activities may result in loss of habitat for pollinator species, including ground-dwelling insects.

Reduced habitat quality
Ground-disturbing activities could indirectly impact special status plant species by disturbing or removing vegetation in or next to special status plant occurrences. This could change species composition and age class distribution, cause erosion, loss of topsoil, or soil compaction (Doerr et al. 1984; Kurz et al. 2008; Harbor 1999; Rab 2004), altering habitat suitability for special status plant species. Soil compaction results in decreased vegetation cover and more exposure of the soil surface to erosion, further disturbing vegetation and altering habitat suitability. Disturbed soils may facilitate noxious weed{ XE "Noxious Weed" } or invasive plant{ XE "Invasive Species" } encroachment (Mack et al. 2000), and vehicles, livestock, equipment, and boots may transport weed seeds and facilitate invasion (Switalski and Jones 2012; Sheley et al. 1996).

4.10.4 Direct and Indirect Impacts

Impacts Common to Alternatives A, C, D, and E
As discussed in **Section 1.5.3**, Planning Criteria{ XE "Planning Criteria" }, all livestock grazing management (in other words, all management actions under all alternatives but Alternative B) must use the BLM Utah Rangeland Health{ XE "Rangeland Health" } Standards and Guidelines for Livestock Grazing Management. Therefore, Alternatives A, C, D, and E must meet or make progress toward meeting the BLM Utah Rangeland Health Standards. Full descriptions of rangeland health standards are provided in **Chapter 2**. On NPS-managed lands, additional criteria beyond BLM Utah Rangeland Health Standards may be required, as specified in the 1999 GzMP{ XE "Grazing Management Plan, Glen Canyon (GzMP 1999)" } and other NPS policies.

Standard 3 specifically addresses special status species. It directs the BLM to ensure that special status species (including threatened and endangered species) are maintained at an appropriate level for the site and the species. This is indicated by population demographics that support successful reproduction, habitat connectivity, recolonization of disturbed habitats, and habitat management that moves threatened and endangered species toward recovery and delisting. The same factors and requirements apply to NPS special status species.

The BLM would continue to follow the Framework for Monitoring, Evaluation, and Adaptive Management in the MMP{ XE "Monument Management Plan, Grand Staircase-Escalante National Monument (MMP 2000)" }; therefore, adaptive management would be incorporated into livestock grazing management under Alternatives A, C, D, and E. Continuously improving livestock grazing management by assessing rangeland health{ XE "Rangeland Health" } and following adaptive management principals would improve the potential to meet BLM Utah Rangeland Health Standard 3. This would impact special status species, as discussed above.

Nonstructural range improvements{ XE "Range Improvement" } are generally not appropriate in Glen Canyon, so no impacts on special status species or populations are expected on NPS-managed lands from these management activities under these alternatives.

Long-term impacts on special status species populations and distribution and on the quality and quantity of habitat, including designated critical habitat, can be mitigated by the same mitigation measures described for fish and wildlife that do not have special status. During sensitive periods, long-term impacts can be further mitigated impacts by excluding livestock from mapped special status plant populations, avian nests, and breeding habitat.

While maximum permitted AUMs vary across alternatives, the density of average actual use AUMs only varies slightly, between 49 and 52 acres available per AUM. There are 52 acres available per AUM under Alternative E, 51 acres available per AUM for Alternative A, 50 acres available per AUM for Alternative D, and 49 acres available per AUM for Alternative C.

Impacts Common to All Alternatives

Under all alternatives, the BLM would comply with the regulations in BLM Manual 6840 Special Status Species Management. The objectives of special status species management are to:

- Conserve and/or recover ESA-listed species and the ecosystems on which they depend so that ESA protections are no longer needed for these species, and
- Initiate proactive conservation measures that reduce or eliminate threats to BLM sensitive species to minimize the likelihood of and need for listing of these species under the ESA.

Therefore, under all alternatives, no decision would be approved or authorized on BLM- or NPS-managed lands that would conflict with the objectives of Manual 6840.

As discussed in **Section 3.8.1**, Current Conditions, Jones's cycladenia populations in GSENM generally grow in steep (35 or more degree) slopes which are inaccessible to livestock. Therefore, direct and indirect impacts, as discussed in under *Nature and Type of Impacts*, are not expected to occur to Jones's cycladenia individuals or habitat under any alternatives.

Alternative A

Under Alternative A, current livestock grazing management would continue at existing permitted levels in the planning area. Under Alternative A, 2,089,000 acres (93 percent) are available for livestock grazing, and 153,000 acres (7 percent) are unavailable for livestock grazing. Livestock grazing would continue at the existing permitted level, with 76,957 active AUMs and an average actual use of 41,343 AUMs. Generally, having greater acres and more AUMs allocated to livestock grazing could result in greater chances for impacts on special status species, as described in *Nature and Type of Impacts*. This could lead to reduced habitat quality and connectivity, declines in population numbers or productivity, and resulting challenges in meeting the BLM Utah's Rangeland Health{ XE "Rangeland Health" } Standard 3.

Under Alternative A, grazing allotments would be assessed and allotment grazing plans would be developed, consistent with the BLM grazing permit{ XE "Permit, Grazing" } renewal process. As

a result, allotments would maintain or continue to move toward meeting BLM Utah Rangeland Health{ XE "Rangeland Health" } Standards, which would increase the potential for meeting BLM Utah Rangeland Health Standard 3.

Table 4-8, Livestock Grazing Allocations in Mexican Spotted Owl and Southwestern Willow Flycatcher Habitat by Alternative, summarizes acres of Mexican spotted owl critical habitat and their PACs{ XE "Protected Activity Center (PAC)" } and southwestern willow flycatcher critical habitat that are available and unavailable to livestock grazing under each alternative.

Table 4-8
Livestock Grazing Allocations in Mexican Spotted Owl and Southwestern Willow Flycatcher Habitat by Alternative

Allocation	Alternative A	Alternative B	Alternative C	Alternative D	Alternative E
Mexican Spotted Owl Critical Habitat (524,100 acres)					
Available	499,100	0	398,300	499,100	499,100
Unavailable	25,000	524,100	125,800	25,000	25,000
Mexican Spotted Owl PACs{ XE "Protected Activity Center (PAC)" } (5,300 acres, 7 PACs total)					
Available	5,300 7 PACs{ XE "Protected Activity Center (PAC)" }	0 PACs{ XE "Protected Activity Center (PAC)" }	3,200 5 PACs[1]	5,300 7 PACs{ XE "Protected Activity Center (PAC)" }	5,300 7 PACs{ XE "Protected Activity Center (PAC)" }
Unavailable	0 PACs{ XE "Protected Activity Center (PAC)" }	5,300 7 PACs{ XE "Protected Activity Center (PAC)" }	2,100 5 PACs[1]	0 PACs{ XE "Protected Activity Center (PAC)" }	0 PACs{ XE "Protected Activity Center (PAC)" }
Southwestern Willow Flycatcher Critical Habitat (1,100 acres)					
Available	1,100	0	100	1,100	1,100
Unavailable	0	1,100	1,000	0	0

Sources: BLM GIS 2014; EPA GIS 2015

[1]Because several PACs{ XE "Protected Activity Center (PAC)" } overlap allotment boundaries, portions of these PACs are both available and unavailable to livestock grazing under this alternative

Under Alternative A, 95 percent of Mexican spotted owl critical habitat and all PACs{ XE "Protected Activity Center (PAC)" } would be in areas that are available for livestock grazing, and all southwestern willow flycatcher critical habitat is available for livestock grazing (**Table 4-8**, Livestock Grazing Allocations in Mexican Spotted Owl and Southwestern Willow Flycatcher Habitat by Alternative). Where present in these areas, southwestern willow flycatchers may be impacted by riparian habitat alteration from livestock use. Mexican spotted owls may be impacted by human presence or noise from livestock management; however, most Mexican spotted owl habitat and PACs are located in rugged and remote country where, as a result, the

magnitude of these impacts is expected to be low. These impacts may result in reduced potential to meet BLM Utah Rangeland Health{ XE "Rangeland Health" } Standard 3, due to changes in population numbers, productivity, and acres of suitable habitat. Alternatively, structural range improvements{ XE "Range Improvement" } that restrict cattle from using riparian areas{ XE "Riparian Area" } and deliver water to upland locations outside of southwestern willow flycatcher habitat would improve the condition of critical habitat. This would result in an increased potential to meet BLM Utah Rangeland Health Standard 3.

Impacts on riparian vegetation represent those on habitat for riparian bird species, including western yellow-billed cuckoo and southwestern willow flycatcher. As discussed in **Section 4.4**, Vegetation, approximately 26,700 acres (88 percent) of riparian vegetation is available for livestock grazing under Alternative A. It is comprised of the NVCS Macrogroup Rocky Mountain and Great Basin Flooded and Swamp Forest. Approximately 2,600 acres (9 percent) is unavailable (BLM GIS 2014).

As described under *Nature and Type of Impacts*, livestock can alter riparian vegetation by trampling vegetation, compacting soils, causing erosion, and reducing native vegetation cover. This would reduce habitat suitability for riparian bird species. Livestock can also temporarily displace individual birds if they are sensitive to livestock noise or presence. This impact would apply particularly to those species that forage or nest in shrubby or understory vegetation, where impacts from livestock could be concentrated. If this were to occur during sensitive periods such as nesting, it could lead to reduced breeding success. These impacts may reduce the potential to meet BLM Utah Rangeland Health{ XE "Rangeland Health" } Standard 3, due to changes in acres of suitable habitat and potential changes in population numbers or productivity. Alternatively, structural range improvements{ XE "Range Improvement" } that restrict cattle from using riparian areas{ XE "Riparian Area" } would improve the condition of riparian habitat. This would increase the potential to meet BLM Utah Rangeland Health Standard 3.

Table 4-9, Livestock Grazing Allocations in Greater Sage-Grouse{ XE "Greater Sage-Grouse" } Habitat by Alternative, summarizes acres available and unavailable to livestock grazing under each alternative that overlie mapped greater sage-grouse PHMA{ XE "Priority Habitat Management Area (PHMA)" } in the planning area.

Table 4-9
Livestock Grazing Allocations in Greater Sage-Grouse{ XE "Greater Sage-Grouse" } Habitat by Alternative

Habitat Type	Allocation	Alternative A	Alternative B	Alternative C	Alternative D	Alternative E
PHMA{ XE "Priority Habitat Management Area (PHMA)" }	Available	10,200	0	10,200	10,200	10,200
PHMA{ XE "Priority Habitat	Unavailable	0	10,200	0	0	0

Table 4-9
Livestock Grazing Allocations in Greater Sage-Grouse{ XE "Greater Sage-Grouse" } Habitat by Alternative

Habitat Type	Allocation	Alternative A	Alternative B	Alternative C	Alternative D	Alternative E
Manageme nt Area (PHMA)" }						

Source: BLM GIS 2014, 2015

Under Alternative A, approximately 10,200 acres of greater sage-grouse**{** XE "Greater Sage-Grouse" **}** PHMA**{** XE "Priority Habitat Management Area (PHMA)" **}**, which is approximately 97 percent of PHMA in the planning area (the remaining 300 acres of PHMA are on lands not managed by the BLM), would be in areas that are available to livestock grazing. Under Alternative A, greater sage-grouse PHMA in the planning area could be impacted by livestock grazing, as discussed under *Nature and Type of Impacts*. However, since livestock grazing would be managed to meet BLM Utah Rangeland Health**{** XE "Rangeland Health" **}** Standards, this would increase the potential for meeting BLM Utah Rangeland Health Standard 3 in the long term.

Table 4-10, Livestock Grazing Allocations in Occupied Listed Plant Habitat by Alternative, summarizes acres of occupied habitat for Kodachrome bladderpod and Jones' cycladenia that are available and unavailable to livestock grazing under each alternative.

Table 4-10
Livestock Grazing Allocations in Occupied Listed Plant Habitat by Alternative

Allocation	Alternative A	Alternative B	Alternative C	Alternative D	Alternative E
Kodachrome Bladderpod (2,000 acres)					
Available	2,000	0	2,000	2,000	2,000
Unavailable	0	2,000	0	0	0
Jones' Cycladenia (50 acres)[1]					
Available[2]	50	0	50	50	50
Unavailable	<1	50	<1	<1	<1

Source: BLM GIS 2014
[1]To estimate acres of occupied Jones' cycladenia habitat, each known point-location occurrence was buffered by a 50-foot radius. Amount of occupied habitat rounded to the nearest 10 acres.
[2]Because this species grows on steep slopes that are inaccessible to livestock, impacts are not expected.

Under Alternative A, all occupied Kodachrome bladderpod habitat and nearly all occupied Jones's cycladenia habitat would be in areas that are available to livestock grazing (**Table 4-10**, Livestock Grazing Allocations in Occupied Listed Plant Habitat by Alternative). Where occupied Kodachrome bladderpod habitat is available to livestock grazing, impacts on individuals as described in the *Nature and Type of Impacts* could occur, resulting in a lower potential to meet BLM Utah Rangeland Health**{** XE "Rangeland Health" **}** Standard 3. As described under *Impacts*

Common to All Alternatives, despite the availability of Jones's cycladenia habitat to livestock grazing, no impacts on Jones's cycladenia in GSENM are expected due to the steep slopes that this plant grows on. Potential impacts on the Glen Canyon Jones's cycladenia population (**Section 3.8.1**) would be the same as described for GSENM.

For Ute ladies'-tresses, only point location data of known occurrences in the decision area are available. However, all of these known occurrences would be in areas that are available to livestock grazing under this alternative. In order to reduce impacts on this species from livestock grazing, the BLM modified the livestock grazing season and grazing frequency in these areas. Livestock grazing during the appropriate season reduces the detrimental impacts on Ute ladies'-tresses.

Nonstructural range improvements**{** XE "Range Improvement" **}** under Alternative A would continue to occur in GSENM to maintain or restore rangelands with native and nonnative species, consistent with the MMP**{** XE "Monument Management Plan, Grand Staircase-Escalante National Monument (MMP 2000)" **}** and BLM Manual 1745 (BLM 1992). Under Alternative A, nonstructural range improvements would be conducted by manual methods, such as manually hand pulling and using hand tools (e.g., chainsaws, machetes, pruners), and by mechanical methods (e.g., roller chopping, chaining, plowing, disking) in areas that are not culturally sensitive. Conducting nonstructural range improvements under Alternative A may impact special status wildlife species by temporarily displacing them from the treatment area, by noise, human presence, and vehicles. Impacts would be less intense for manual range improvements conducted using hand tools, compared with those conducted using machinery.

Nonstructural range improvements**{** XE "Range Improvement" **}** may temporarily disrupt California condor foraging opportunities, while nonstructural improvements are ongoing; however, this short-term impact would last for the duration of the treatment only. If nonstructural improvements were carried out in riparian areas**{** XE "Riparian Area" **}**, riparian-obligate special status bird species, such as the western yellow-billed cuckoo and southwestern willow flycatcher, may be temporarily disrupted, due to noise or human presence. If work were to occur during the breeding season, breeding could be disrupted or precluded and productivity could be lowered, thereby lessening the potential to meet BLM Utah Rangeland Health**{** XE "Rangeland Health" **}** Standard 3. If nonstructural improvements were conducted within populations of special status plant species, soil disturbance or machinery access may result in plant mortality or reduced productivity. Conducting improvements during the nonbreeding season, or ensuring that these species are absent from the treatment area would avoid these impacts.

Prescribed fire is allowed under Alternative A, in areas where fires occurred historically but where the natural fire cycle is prevented. Increased human activity and noise associated with prescribed fire could increase the likelihood for injury or mortality to special status species. There also is the potential for habitat avoidance or changes to survival or reproduction, caused by changes to nesting, breeding, foraging, or roosting behavior. However, these impacts would be of short duration and limited in scope, and mitigations would apply to minimize impacts. Additionally, since special status species are adapted to the types of fires that historically

occurred under natural fire cycles, impacts on these species are anticipated to be limited, when using prescribed fire for nonstructural range improvements{ XE "Range Improvement" }.

Chemical treatment methods for nonstructural range improvements{ XE "Range Improvement" } are allowed under Alternative A and are generally limited to reducing noxious weed{ XE "Noxious Weed" } cover. Chemical treatments would generally be limited to hand spraying, which greatly reduces impacts on special status species, compared with other methods. It allows special status wildlife to disperse from a treatment area, and allows the applicator to avoid applying herbicides to nontarget vegetation, including special status plant species. Chemical control would follow applicable guidance, including the BLM's Programmatic Weed EA, as well as the NPS 2006 Management Policies and the Glen Canyon IPMP. This would reduce the potential for impacts on special status species from chemical treatments. Improved habitat resulting from noxious weed reduction under Alternative A would increase the potential for meeting BLM Utah Rangeland Health{ XE "Rangeland Health" } Standard 3.

Under Alternative A, the need for and extent of structural range improvements{ XE "Range Improvement" } would be considered on a case-by-case basis and would be identified during permit renewal, in conformance with the MMP{ XE "Monument Management Plan, Grand Staircase-Escalante National Monument (MMP 2000)" }. Where fencing and water developments were to result in increased protections for riparian and wetland{ XE "Wetland" } areas from overuse by cattle, the western yellow-billed cuckoo and southwestern willow flycatcher would be beneficially impacted by resulting habitat improvement. Increases in water quality would impact downstream listed fish species. Where fences result in mortality of young big game animals or other wildlife, this would represent an increase in available forage carcasses for California condors.

Structural range improvements{ XE "Range Improvement" } generally result in some level of soil disturbance to install, which can result in the impacts on special status species habitat described in *Nature and Type of Impacts*. Under Alternative A, soils management in conformance with the MMP{ XE "Monument Management Plan, Grand Staircase-Escalante National Monument (MMP 2000)" } would protect soils from the impacts of ground-disturbing activities. Reducing soil disturbance would impact special status species by maintaining native vegetation cover and reducing the establishment and spread of nonnative invasive plant{ XE "Invasive Species" } species and noxious weeds{ XE "Noxious Weed" }. It would also impact downstream listed fish species by reducing erosion and sediment runoff into waterways.

Where livestock grazing is available, periodic cattle mortality would provide forage carcass opportunities for California condor.

Alternative B

Under Alternative B, no acres and no AUMs would be available for livestock grazing, which would be discontinued in the decision area. Impacts on special status species could occur by removing structural range improvements{ XE "Range Improvement" } and restoring nonstructural range improvements, consistent with the MMP{ XE "Monument Management Plan, Grand Staircase-Escalante National Monument (MMP 2000)" }. These impacts would be similar to those described under Alternative A; however, the extent and duration of impacts would be greatly reduced, compared with Alternative A.

Alternative C

Under Alternative C, 1,619,700 acres (72 percent) would be available for livestock grazing and 622,300 acres (28 percent) would be unavailable for livestock grazing. There would be 63,144 active AUMs, with a projected average actual use of 33,368 AUMs. These allocations represent a 23 percent decrease in available acres and an 18 percent decrease in active AUMs, compared with Alternative A.

Reductions in acres available to grazing under Alternative C would result, in part, from Alternative C's emphasis on large, ungrazed reference areas; objectives and management actions under Alternative C are based on grazed areas meeting standards that would be set by these areas.

Under Alternative C, 76 percent of Mexican spotted owl critical habitat and 60 percent of PAC**{** XE "Protected Activity Center (PAC)" **}** acreage would be in areas that are available for livestock grazing. Only 9 percent of southwestern willow flycatcher critical habitat would be available to livestock grazing, a reduction of 91 percent from Alternative A (**Table 4-8**, Livestock Grazing Allocations in Mexican Spotted Owl and Southwestern Willow Flycatcher Habitat by Alternative). Impacts on Mexican spotted owl would be similar to those described under Alternative A, since five of seven PACs and most critical habitat would still be available to livestock grazing. Impacts on southwestern willow flycatcher, if present in its critical habitat, would be greatly reduced, relative to Alternative A. These impacts may result in increased potential to meet BLM Utah Rangeland Health**{** XE "Rangeland Health" **}** Standard 3, due to positive impacts on required vegetation and the potential for recolonization of disturbed habitat.

Under Alternative C, impacts on riparian vegetation representing habitat for western yellow-billed cuckoo and southwestern willow flycatcher would be reduced, compared with Alternative A. This is because acres of riparian vegetation available to livestock grazing would be reduced by approximately 6,700 acres (25 percent decrease), and acres of riparian vegetation unavailable to livestock grazing would be increased by approximately 7,500 acres (288 percent increase), compared with Alternative A. These impacts may increase the potential to meet BLM Utah Rangeland Health**{** XE "Rangeland Health" **}** Standard 3, due to increased riparian habitat quality.

Under Alternative C, approximately 10,200 acres of greater sage-grouse**{** XE "Greater Sage-Grouse" **}** PHMA**{** XE "Priority Habitat Management Area (PHMA)" **}**, which is approximately 97 percent of PHMA in the planning area (the remaining 300 acres of PHMA are on lands not managed by the BLM), would be in areas that are available to livestock grazing (**Table 4-9**, Livestock Grazing Allocations in Greater Sage-Grouse**{** XE "Greater Sage-Grouse" **}** Habitat by Alternative). This is the same amount of PHMA that would be available to livestock grazing under Alternative A. Under Alternative C, 41 percent fewer AUMs would be available, relative to Alternative A. Reducing grazing density under Alternative C would reduce the intensity of impacts on greater sage-grouse and their habitat, relative to Alternative A.

Under Alternative C, all occupied Kodachrome bladderpod habitat and nearly all occupied Jones's cycladenia habitat would be in areas that are available to livestock grazing (**Table 4-10**, Livestock Grazing Allocations in Occupied Listed Plant Habitat by Alternative). Ute ladies'-tresses populations would also be in areas available to livestock grazing. Impacts on these listed plant species would be as described under Alternative A.

For most special status species and habitats, maintaining large, ungrazed reference areas under Alternative C would result in reduced short-term impacts, relative to Alternative A, especially those impacts related to disturbance from human presence or noise. In the long term, ungrazed reference areas would have impacts on special status species by improving habitat quality. Where fencing is required to exclude livestock from a reference area, impacts on special status species, such as restricted movement of wildlife and their injury or death from colliding or becoming entangled with fencing could occur. This would increase impacts, compared with Alternative A, if new fencing is needed to establish ungrazed reference areas.

Nonstructural range improvements{ XE "Range Improvement" } under Alternative C would occur in GSENM to maintain or restore rangelands, consistent with the MMP{ XE "Monument Management Plan, Grand Staircase-Escalante National Monument (MMP 2000)" } and BLM Manual 1745. The use of native species would be emphasized in restoration, which would impact special status species by improving breeding and foraging habitat. Passive restoration and non-chemical methods would be the priority for preventing the introduction, establishment, and spread of noxious weeds{ XE "Noxious Weed" } or nonnative invasive species{ XE "Invasive Species" }. Passive restoration approaches alone may not improve habitats that are degraded by annual grasses or prevent further spread of nonnative invasive plant species (McIver and Starr 2001). However, planning area lands would still be managed, with the overall objective of maintaining, restoring, or enhancing vegetation, consistent with the MMP and BLM Manual 1745. Because of this, passive restoration would not be used in areas invaded by annual grasses, because it would likely not be effective in achieving this objective.

Other nonstructural range improvements{ XE "Range Improvement" } under Alternative C, including mechanical methods, machinery, chemical treatments (for objectives other than weed reduction), and prescribed fire, would be conducted by the same methods described under Alternative A. The need for and extent of structural range improvements would be assessed in a manner similar to that described under Alternative A. These management actions would result in the same impacts on special status species and their habitat and populations as those described under Alternative A.

Under Alternative C, management would protect soils from ground-disturbing structural range improvements{ XE "Range Improvement" }, as described under Alternative A. However, under Alternative C, soils protections would be extended to areas with high cover of biological soil crusts{ XE "Biological Soil Crust" } and soils with high biodiversity value, such as gypsiferous soils, which support special status plant species. Extended protections would result in fewer acres of soil disturbance associated with structural range improvements. Impacts would be similar to those described under Alternative A; however, since soil protections would be increased, detrimental impacts on special status species habitat would be decreased under Alternative C, relative to Alternative A.

Under Alternative C, forage carcass availability for California condors would be reduced, compared with Alternative A. This is because fewer acres would be available to livestock grazing and fewer AUMs would be allocated.

Alternative D

Under Alternative D, 2,135,200 acres (95 percent) would be available for livestock grazing, and 106,800 acres (5 percent) would be unavailable for livestock grazing. There would be 107,955 active AUMs. They represent a 2 percent increase in available acres and a 40 percent increase in active AUMs, compared with Alternative A.

Under Alternative D, acres of Mexican spotted owl critical habitat and PACs{ XE "Protected Activity Center (PAC)" } available and unavailable to livestock grazing would be nearly the same as under Alternative A. Acres of southwestern willow flycatcher critical habitat available to livestock grazing are the same as under Alternative A. Acres of occupied Kodachrome bladderpod and Jones's cycladenia habitat, and all Ute ladies'-tresses populations available to livestock grazing would be the same as under Alternative A (**Table 4-10**, Livestock Grazing Allocations in Occupied Listed Plant Habitat by Alternative). Impacts on these special status species under Alternative D would be the same as those described under Alternative A.

Under Alternative D, impacts on riparian vegetation representing habitat for western yellow-billed cuckoo and southwestern willow flycatcher would be increased, compared with Alternative A. This is because acres of riparian vegetation available to livestock grazing would be increased by approximately 2,200 acres (8 percent increase), and acres of riparian vegetation unavailable to livestock grazing would be decreased by approximately 1,100 acres (42 percent decrease), compared with Alternative A. These impacts may result in a somewhat decreased potential to meet BLM Utah Rangeland Health{ XE "Rangeland Health" } Standard 3, due to reduced riparian habitat quality.

Under Alternative D, approximately 10,200 acres of greater sage-grouse{ XE "Greater Sage-Grouse" } PHMA{ XE "Priority Habitat Management Area (PHMA)" }, which is approximately 97 percent of PHMA in the planning area (the remaining 300 acres of PHMA are on lands not administered by the BLM), would be in areas that are available to livestock grazing (**Table 4-9**, Livestock Grazing Allocations in Greater Sage-Grouse{ XE "Greater Sage-Grouse" } Habitat by Alternative). This is the same amount of PHMA that would be available to livestock grazing under Alternative A. Available AUMs would be the same as under Alternative A. Impacts on greater sage-grouse under Alternative D would be the same as those described under Alternative A.

Under Alternative D, nonstructural range improvements{ XE "Range Improvement" } would be conducted by all available and appropriate treatment measures, in compliance with BLM Manual 9011, Chemical Pest Control, or current guidance, including aerial herbicide treatment. Additionally, chemical control would not be limited to noxious weed{ XE "Noxious Weed" } treatments, but it could be used for sagebrush thinning and brush control. Chemical control would follow applicable guidance, including the BLM's Programmatic Weed EA, as well as the NPS 2006 Management Policies and the Glen Canyon IPMP. This would reduce the potential for impacts on special status species from chemical treatments. Improved habitat resulting from noxious weed reduction under Alternative A would increase the potential for meeting BLM Utah Rangeland Health{ XE "Rangeland Health" } Standard 3.

Prescribed fire would be used for brush, pinyon, and juniper control; it would not be limited to areas that have burned historically, as is the case under Alternative A. Impacts would be similar

to those described under Alternative A; however, since prescribed fire would be used in more areas than under Alternative A, impacts on special status species may be correspondingly increased in extent and duration.

Under Alternative D, impacts on special status species from water developments, fencing, and other structural range improvements{ XE "Range Improvement" } would be the same as those described under Alternative A.

Alternative D contains fewer protections for soil resources than does Alternative A. Therefore, impacts on special status species from soil-disturbing activities, as described under the *Nature and Type of Impacts* would be greater than under Alternative A.

Impacts on California condor forage carcass availability would be approximately the same as those under Alternative A.

Alternative E

Under Alternative E, 2,065,300 acres (92 percent) would be available for livestock grazing and 176,700 acres (7 percent) would be unavailable for livestock grazing. There would be 76,520 active AUMs. These allocations represent a 1 percent decrease in available acres and a 1 percent decrease in active AUMs, compared with Alternative A.

Under Alternative E, acres of Mexican spotted owl critical habitat and PACs{ XE "Protected Activity Center (PAC)" } and southwestern willow flycatcher available and unavailable for livestock grazing would be the same as under Alternative D (**Table 4-8**, Livestock Grazing Allocations in Mexican Spotted Owl and Southwestern Willow Flycatcher Habitat by Alternative). Acres of occupied Kodachrome bladderpod and Jones's cycladenia habitat, and all Ute ladies'-tresses populations available to livestock grazing would be the same as under Alternative D (**Table 4-10**, Livestock Grazing Allocations in Occupied Listed Plant Habitat by Alternative). Impacts on these special status species under Alternative E would be the same as those described under Alternative D.

Under Alternative E, impacts on riparian vegetation representing habitat for western yellow-billed cuckoo and southwestern willow flycatcher would be similar, compared with Alternative A. This is because acres of riparian vegetation available to livestock grazing would be increased by approximately 500 acres (2 percent increase); acres of riparian vegetation unavailable to livestock grazing would be increased by approximately 200 acres (8 percent increase), compared with Alternative A. These allocations would result in a similar potential to meet BLM Utah Rangeland Health{ XE "Rangeland Health" } Standard 3, compared with Alternative A.

Under Alternative E, approximately 10,200 acres of greater sage-grouse{ XE "Greater Sage-Grouse" } PHMA{ XE "Priority Habitat Management Area (PHMA)" }, which is approximately 97 percent of PHMA in the planning area (the remaining 300 acres of PHMA are on lands not managed by the BLM), would be in areas that are available to livestock grazing (**Table 4-9**, Livestock Grazing Allocations in Greater Sage-Grouse{ XE "Greater Sage-Grouse" } Habitat by Alternative). This is the same amount of PHMA that would be available to livestock grazing under Alternative A. Under Alternative E, 29 percent fewer AUMs would be available, relative to Alternative A. Reducing grazing density under Alternative E would reduce the intensity of

detrimental impacts on greater sage-grouse and their habitat, relative to Alternative A. Further, managing livestock grazing to meet BLM Utah Rangeland Health{ XE "Rangeland Health" } Standards would increase the potential for meeting BLM Utah Rangeland Health Standard 3 in the long term compared to Alternative A.

Nonstructural range improvements{ XE "Range Improvement" } under Alternative E would continue to occur in GSENM to maintain or restore rangelands with native and nonnative species, consistent with BLM Manual 1745. Under Alternative E, nonstructural range improvements would be conducted by all available and appropriate treatment measures, in compliance with BLM Manual 9011, Chemical Pest Control, or current guidance, as described under Alternative D. Impacts would be the same as those described under Alternative D.

Under Alternative E, the need for and extent of structural range improvements{ XE "Range Improvement" } would be assessed, as described under Alternative D. Impacts on special status species from water developments and fencing would be the same as those described under Alternative A.

Under Alternative E, soils management in conformance with the MMP{ XE "Monument Management Plan, Grand Staircase-Escalante National Monument (MMP 2000)" } would protect soils from ground-disturbing structural range improvements{ XE "Range Improvement" }, as described under Alternative A. However, as described under Alternative C, soils protections would be extended to areas with high cover of biological soil crusts{ XE "Biological Soil Crust" }, soils with high biodiversity value (e.g., gypsiferous soils), and soils susceptible to degradation; impacts would be the same as those described under Alternative C.

Impacts on California condor forage carcass availability would be somewhat reduced, compared with Alternative A, due to fewer AUMs being allocated.

4.10.5 Cumulative Impacts

The cumulative impacts analysis area for special status species varies by species. For listed fish species, the cumulative impacts analysis area is the same as the cumulative impacts analysis area for water resources, extending outside the planning area and following watershed boundaries that completely or partially overlap it. For terrestrial special status wildlife and plant species and birds, the cumulative impacts analysis area is the planning area.

Cumulative impacts on special status species are related to those described above for vegetation, since vegetation communities provide the habitat for special status species and can affect habitat for fish species, for example riparian vegetation.

Past, present, and reasonably foreseeable future actions and conditions in the cumulative impacts analysis area (see **Table 4-1**), both on public and private land, that have affected and will likely continue to affect special status species are as follows:

- Other federal, state, and county land use planning efforts
- Livestock grazing management
- Fish and wildlife and special status species management

- Vegetation and noxious weed{ XE "Noxious Weed" } management
- Recreation and visitor use
- Lands and realty actions
- Infrastructure-scale water developments
- Wildfire
- Drought
- Climate change{ XE "Climate Change" }

Many of these activities change habitat conditions, which then cause or favor other habitat changes. For example, wildfire removes habitat, and affected areas are then more susceptible to weed invasion, soil erosion, and sedimentation of waterways, all of which degrade habitats. In general, resource use activities have cumulatively caused habitat removal, fragmentation, and noise and have increased human presence and weed spread; conversely, land planning efforts and vegetation, habitat, and weed treatments have countered these impacts by improving habitat connectivity, productivity, diversity, and health.

Among the contributing factors{ XE "Contributing Factor" } in the decline of special status species is the loss or fragmentation of available habitat. Most special status species depend on rare or unique habitats, such as riparian areas{ XE "Riparian Area" } for western yellow-billed cuckoo and southwestern willow flycatcher, and listed fish species. Most special status plant species have very narrow habitat requirements and are not able to grow or survive outside of these areas. Development pressure exists throughout the southwestern United States, particularly in and next to sources of water. Demand for water for industrial, irrigation, and residential use has had major long-term impacts on special status fish. Dams and diversions disrupting flow regimes have altered habitat for fish and riparian-dependent species. Reductions in water quality have had similar long-term impacts. As a result, development has impacted special status species.

Tamarisk invasion in riparian areas{ XE "Riparian Area" } has resulted in flow reductions for native fishes, increased temperature and salinity, and increased risk of wildfire. However, tamarisk invasion has also increased available nesting habitat for southwestern willow flycatcher.

Climate change{ XE "Climate Change" } could increase or decrease temperatures and alter precipitation patterns. This would affect soil conditions and vegetation distribution and water flows, quality, and temperature (Lenihan et al. 2003; McKenney et al. 2007; Hamann and Wang 2006; Eaton and Scheller 1996). Riparian and wetland{ XE "Wetland" } areas would be affected by reduced high-elevation winter snowpack, modified low-elevation precipitation amounts and timing, and the associated changes in flow regimes. Such changes would alter habitat conditions, potentially creating conditions that could favor certain species or communities, weeds, or pests (Hellmann et al. 2007).

Recreation, including OHV{ XE "Off-Highway Vehicle (OHV)" } use, has caused at least some level of impacts on special status species and their habitats in the cumulative impacts analysis area. Increasing human populations has led to a dramatic increase in OHV use and other

recreation. This has increased the disturbance, injury, and mortality of listed plants and ground-dwelling species with low mobility. Transportation corridors cross through the habitat of many special status species found in the planning area. Environmental impacts vary by species and by the location, level of use, and speed of travel over the road.

Under the MMP{ XE "Monument Management Plan, Grand Staircase-Escalante National Monument (MMP 2000)" }-A alternatives, impacts on special status species would be minimized to the extent practicable and feasible, through restrictions and stipulations on livestock grazing management and by following relevant BLM and NPS management documents. Habitat conditions would be improved through nonstructural range improvements{ XE "Range Improvement" }, structural improvements that are protective of riparian habitat, and weed prevention and control.

Under the MMP{ XE "Monument Management Plan, Grand Staircase-Escalante National Monument (MMP 2000)" }-A alternatives, the BLM and NPS would work toward achieving BLM Utah Rangeland Health{ XE "Rangeland Health" } Standards in GSENM and Glen Canyon. Additionally, on NPS-managed lands, criteria beyond BLM Utah Rangeland Health Standards may be required, as specified in the 1999 GzMP{ XE "Grazing Management Plan, Glen Canyon (GzMP 1999)" } and other NPS polices. However, the alternatives would differ in the time and methods used to reach that goal. Special status species habitat conditions would be improved through grazing management, vegetation treatments{ XE "Vegetation Treatment" }, structural and nonstructural range improvements{ XE "Range Improvement" }, and weed prevention and control. As a result, the incremental contribution of the MMP-A alternatives to cumulative impacts on special status species is expected to be less than significant.

4.10.6 References

Belsky, A. J., A. Matzke, and S. Uselman. 1999. "Survey of livestock influences on stream and riparian ecosystems in the western United States." *Journal of Soil and Water Conservation* 54:419-431.

Bock, C. E., V. A. Saab, T. D. Rich, and D. S. Dobkin. 1993. "Effects of livestock grazing on neotropical migratory landbirds in western North America." In: Status and Management of Neotropical Migratory Birds (D. M. Finch and P. W. Stangel, editors). US Department of Agriculture, Forest Service, Rocky Mountain Forest and Range Experiment Station, General Technical Report RM-229. Fort Collins, Colorado. Pp. 296-309.

BLM (United States Department of the Interior, Bureau of Land Management). 1997. Standards for Rangeland Health{ XE "Rangeland Health" } and Guidelines for Grazing Management for BLM Lands in Utah. United States Department of the Interior, Bureau of Land Management, Utah State Office, Salt Lake City.

_____. 1992. Manual 1745, Introduction, Transplant, Augmentation, and Reestablishment of Fish, Wildlife, and Plants. BLM, Washington, DC. March 26, 1992.

BLM GIS. 2014. Base GIS data on file with the BLM's eGIS server used for calculations or figures to support the MMP{ XE "Monument Management Plan, Grand Staircase-Escalante National Monument (MMP 2000)" }-A. BLM, Grand Staircase Escalante National Monument, Utah.

Connelly, J. W., S. T. Knick, M. A. Schroeder, and S. J. Stiver. 2004. Conservation Assessment of Greater Sage-Grouse{ XE "Greater Sage-Grouse" } and Sagebrush Habitats. Western Association of Fish and Wildlife Agencies. Unpublished report. Cheyenne, Wyoming. Internet website: https://sagemap.wr.usgs.gov/docs/Greater_Sage-grouse_Conservation_Assessment_060404.pdf.

Davies, K. W., J. D. Bates, T. J. Svejcar, and C. S. Boyd. 2010. "Effects of long-term livestock grazing on fuel characteristics in rangelands: An example from the sagebrush steppe." *Rangeland Ecology and Management* 63:662-669.

DiTomaso, J. M. 2000. "Invasive weeds in rangelands: Species, impacts, and management." *Weed Science* 48(2):255-265.

Doerr, T. B., E. F. Redente, and F. B. Reeves. 1984. "Effects of soil disturbance on plant succession and levels of mycorrhizal fungi in a sagebrush-grassland community." *Journal of Range Management* 37(2):135-139.

Eaton, J. G., and R. M. Scheller. 1996. "Effects of climate warming on fish thermal habitat in streams of the United States." *Limnology and Oceanography* 41(5):1109-1115.

EPA GIS (United States Environmental Protection Agency Geographic Information System). 2015. Published GIS data of critical habitat. Internet website: http://ecos.fws.gov/crithab/. Last updated September 11, 2015.

Fleischner, T. L. 1994. "Ecological costs of livestock grazing in western North America." *Conservation Biology* 8(3): 629-644.

Frost, R. A., and K. L. Launchbaugh. 2003. "Prescription grazing for rangeland weed management A new look at an old tool." *Rangelands* 25:43-47.

Geist, V. 1978. "Behavior." In: *Big Game of North America: Ecology and Management* (J. L. Schmidt and D. L. Gilbert, editors). Stackpole Books, Harrisburg, Pennsylvania. Pp. 283-296.

Hamann, A., and T. Wang. 2006. "Potential effects of climate change on ecosystem and tree species distribution in British Columbia." *Ecology* 87(11):2773-2786.

Harbor, J. 1999. Engineering geomorphology at the cutting edge of land disturbance: Erosion and sediment control on construction sites." *Geomorphology* 31: 247-263.

Harris, C. M. 1991. *Handbook of Acoustical Measurements and Noise Control*. McGraw-Hill, Inc., New York, New York.

Hayward, B., E. J. Heske, and C. W. Painter. 1997. “Effects of livestock grazing on small mammals at a desert cienega.” *Journal of Wildlife Management* 61(1):123-129.

Hellmann, J. J., J. E. Byers, B. G. Bierwagen, and J. S. Dukes. 2007. “Five potential consequences of climate change for invasive species{ XE "Invasive Species" }.” *Conservation Biology* 22(3):534-543.

Kauffman, J. B., and W. C. Krueger. 1984. “Livestock impacts on riparian ecosystems and streamside management implications: A review.” *Journal of Range Management* 37(5):430-438.

Knick S. T., S. E. Hanser, R. F. Miller, D. A. Pyke, M. J. Wisdom, S. P. Finn, E. T. Rinkes, and C. J. Henny. 2011. “Ecological influence and pathways of land use in sagebrush.” In: “Greater sage-grouse: Ecology and conservation of a landscape species and its habitats.” *Studies in Avian Biology* 38:203-251. University of California Press, Berkeley.

Kurz, W. A., G. Stinson, G. J. Rampley, C. C. Dymond, and E. T. Meilson. 2008. “Risk of natural disturbances makes future contribution of Canada’s forests to the global carbon cycle highly uncertain.” *PNAS* 105(5):1551-1555.

Lenihan, J. M., R. Draypek, D. Bachelet, and R. P. Neilson. 2003. “Climate change{ XE "Climate Change" } effects on vegetation distribution, carbon, and fire in California.” *Ecological Applications* 13(6):1667-1681.

Lewis, M. B. 2013. “Roads and the reproductive ecology of *Hesperidanthus suffrutecens*, an endangered shrub.” Master’s thesis. Utah State University, Logan.

Mack, R. N., D. Simberloff, W. M. Lonsdale, H. Evans, M. Clout, and F. Bazzaz. 2000. “Biotic invasions: causes, epidemiology, global consequences and control.” *Issues in Ecology* 5:1-20.

Manier, D. J., D. J. A. Wood, Z. H. Bowen, R. M. Donovan, M. J. Holloran, L. M. Juliusson, K. S. Mayne, et al. 2013. Summary of science, activities, programs, and policies that influence the rangewide conservation of Greater Sage-Grouse{ XE "Greater Sage-Grouse" } (*Centrocercus urophasianus*): USGS Open-File Report 2013-1098. Internet website: http://pubs.usgs.gov/of/2013/1098/.

McKenney, D. W., J. H. Pedlar, K. Lawrence, K. Campbell, and M. F. Hutchinson. 2007. “Potential impacts of climate change on the distribution of North American trees.” *BioScience* 57(11):939-948.

McIver, J., and L. Starr. 2001. “Restoration of degraded lands in the interior Columbia River basin: Passive vs. active approaches.” *Forest Ecology and Management* 153:15-28.

Rab, M. A. 2004. “Recovery of soil physical properties from compaction and soil profile disturbance caused by logging of native forest in Victorian Central Highlands, Australia.” *Forest Ecology and Management* 191:329-340.

Reisner, M. D., J. B. Grace, D. A. Pyke, and P. S. Doescher. 2013. "Conditions favouring *Bromus tectorum* dominance of endangered sagebrush steppe ecosystems." *Journal of Applied Ecology* 50(4):1-10.

Sarr, D. A. 2002. "Riparian livestock exclosure research in the western United States: A critique and some recommendations." *Environmental Management* 30(4):516-526.

Sheley, R., M. Manourian, G. Marks. 1996. "Preventing noxious weed{ XE "Noxious Weed" } invasion." *Rangelands* 18(3):100-101.

Switalski, A. T., and A. Jones. 2012. "Off-road vehicle best management practices for forestlands: A review of scientific literature and guidance for managers." *Journal of Conservation Planning* (8):12-24.

Taylor, F. R., L. A. Gillman, L. P. Gillman, and J. W. Pedretti. 1989. "Impact of cattle on two isolated fish populations in Pahranagat Valley, Nevada." *The Great Basin Naturalist* 49(4):491-495. October 31, 1989.

Tegen, I., A. A. Lacis, and I. Fung. 1996. "The influence on climate forcing of mineral aerosols from disturbed soils." *Nature* 380:419-422.

Wijayratne, U. C., S. J. Scoles-Sciulla, and L. A. Defalco. 2009. "Dust deposition effects on growth and physiology of the endangered *Astragalus jaegerianus* (Fabaceae)." *Madrono* 56:81-88.

Zia-Khan, S., W. Spreer, Y. Pengnian, X. Zhao, H. Othmanli, X. He, and J. Muller. 2015. "Effect of dust deposition on stomatal conductance and leaf temperature of cotton in northwest China." *Water* 7:116-131.

4.11 CULTURAL RESOURCES

This section discusses impacts and adverse effects on historic properties from proposed management actions.

4.11.1 Methods of Analysis

Cultural resource baseline information in **Section 3.9** provides current understanding of known resources, which was used to determine the condition of the resources. This known information was overlain with the actions found under each alternative in **Chapter 2**. Conclusions were drawn based on an understanding of how these types of actions could affect known and potentially discoverable resources.

Also, the agency considered all laws pertinent to determining impacts on NRHP{ XE "National Register of Historic Places (NRHP)" }-eligible cultural resources, such as historic properties, as defined by the NHPA{ XE "National Historic Preservation Act (NHPA)" } of 1966, and included them in criteria for determining impacts under NEPA{ XE "National Environmental Policy Act (NEPA)" }. As described in **Section 3.9**, the NPS and BLM have a wide variety of terms for cultural resources, including those resources that may not be eligible for listing on the NRHP but that still require consideration under other legislation, such as AIRFA{ XE "American Indian

Religious Freedom Act (AIRFA)" **}** When referring to historic properties in Chapter 4, these additional resources, sacred sites, and other areas of significance to Native Americans, are included to reflect the obligation of the NPS and BLM to comply with legislation other than the NHPA to avoid, minimize, or resolve adverse effects. These are also discussed in **Section 4.20**, Tribal Interests.

Section 106 of the NHPA**{** XE "National Historic Preservation Act (NHPA)" **}** requires the federal government to consider potential adverse effects from their actions on historic properties, i.e., those cultural resources eligible for listing on the NRHP**{** XE "National Register of Historic Places (NRHP)" **}**. The properties must meet one or more NRHP criteria, be associated with an important historic context, and retain sufficient historic integrity to convey their significance (NPS 2002). Historic properties are significant for their association with important events or persons, for their importance in design or construction, or for their information potential (Criteria A, B, C, and D, respectively).

For many prehistoric archaeological sites or districts, which are often eligible under Criterion D, historic integrity relates to archaeological deposits that are relatively intact and have not been severely impacted by later cultural activities, human or animal disturbances, or natural processes. Archaeological sites may contain elements that could impact a resource's integrity, such as a nineteenth century homestead located on an earlier prehistoric midden; alternatively, the site's multiple occupations could both be considered eligible for listing on the NRHP**{** XE "National Register of Historic Places (NRHP)" **}** under different criteria and significance. However, because of the complexity of the archaeological record, integrity is a relative measure, and its definition depends on the historic context. Overall preservation of the information potential is critical; the integrity of location, design, materials, association, and workmanship is especially important.

Other elements of integrity, such as setting, feeling, and association, may be more critical for other types of historic properties. Examples are structures, buildings, objects, TCPs**{** XE "Traditional Cultural Property (TCP)" **}** or resources eligible under other NRHP**{** XE "National Register of Historic Places (NRHP)" **}** criteria detailed in 36 CFR, Subpart 60.4. For example, the community that holds the beliefs, carries out the practices in, or is affiliated with a TCP is best able to define its significance. If the historic property is known or likely to be regarded by a cultural group as important in retaining or transmitting a belief, or important to the performance of a practice, the property can be taken to have an integral relationship with the belief or practice, and vice versa (Parker and King 1998). The affiliation of a given cultural group with a TCP could provide context for understanding impacts under NEPA**{** XE "National Environmental Policy Act (NEPA)" **}**, although the significance of any impacts would be determined in consultation with the group that defines why such a TCP is important.

Impacts on historic properties are assessed by applying the criteria of adverse effect, as defined in 36 CFR, Subpart 800.5(a)(1):

> An adverse effect is found when an undertaking may alter, directly or indirectly, any of the characteristics of a historic property that qualify the property for inclusion in the National Register in a manner that would diminish the integrity of the property's location, design, setting, materials, workmanship, feeling, or association. Adverse effects

may include reasonably foreseeable impacts caused by the undertaking that may occur later in time, be farther removed in distance, or be cumulative.

As described in **Section 3.9**, Cultural Resources, the BLM (Zweifel 2016) also specifically defines impacts in its study as the presence of grazing at a historic property. This would be the case where the grazing damage is not sufficient to alter the qualities that make a resource eligible for listing on the NRHP{ XE "National Register of Historic Places (NRHP)" }. Therefore, when impacts are used in these analyses, they refer to the definition from Zweifel's study (2016). Impacts under NEPA{ XE "National Environmental Policy Act (NEPA)" }, however, are specifically referenced as such. The BLM's definition provided above is consistent with a finding of no adverse effect described at 36 CFR, Subpart 800.5(b), where the severity of damage does not meet the criteria at 36 CFR, Subpart 800.5(a)(1).

To satisfy compliance obligations under Section 106 of the NHPA{ XE "National Historic Preservation Act (NHPA)" }, the BLM is preparing a programmatic agreement, as allowed in 36 CFR, Subpart 800.14(b)(1). The programmatic agreement outlines general and specific measures the BLM, as lead federal agency, will take to fulfill responsibilities for protecting historic properties under the NHPA. A cultural resources management protocol (**Appendix C**) details these approaches; a programmatic agreement between the BLM and NPS will ensure that these procedures are consistently followed.

In addition to the assumptions in **Section 4.1.1**, the analysis assumes the following:

- Human occupation of North America over the last 13,000 years has left its mark on all landforms, and sites could be on the surface or deeply buried. There could be TCPs{ XE "Traditional Cultural Property (TCP)" } or areas of importance to contemporary Native Americans or communities whose significance may not be readily identifiable outside of those communities.
- The information on cultural resources in the decision area is based on the results of industry and federal agency inventory projects, which provides insight into the relative potential for historic properties in the planning area. However, as these data are geographically biased toward past project-oriented undertakings and cannot accurately predict where and how many resources may exist in unsurveyed areas, this analysis does not attempt to quantify affected resources.
- The existing level of cultural resource data derived from regional overviews and field inventories are sufficient to identify and analyze issues during NEPA{ XE "National Environmental Policy Act (NEPA)" } analysis and land use planning. Additional inventories to identify cultural resources may be necessary before any future land use actions are authorized.

4.11.2 Factors for Analysis

NEPA{ XE "National Environmental Policy Act (NEPA)" } analyses should provide information for determining the extent or degree to which historic properties may be altered, their physical integrity may be lost, or the setting of the resource may be damaged (36 CFR, Part 800). The factors for analysis also might be used to decide whether a proposed action would adversely affect future opportunities for scientific research, preservation, or public appreciation are

foreclosed or otherwise adversely affected by a proposed action. The factors for analysis are presented below.

- *Accessibility and proximity of historic properties*—The accessibility of certain historic properties may be of importance for determining impacts and adverse effects under NEPA{ XE "National Environmental Policy Act (NEPA)" }. Examples are those that might be close to roads and those near various forms of potential impacts, such as high-intensity grazing (due to nearby salt licks, corrals, water sources, other concentrating elements for livestock), vehicular traffic, and unauthorized resource collection from visitors.
- *The potential for adverse impacts under NEPA{ XE* "National Environmental Policy Act (NEPA)" }, as affected by
  - Changes in acres available for livestock grazing
  - Changes in density of AUMs for livestock (acres available per AUM)
  - Changes in AUMs allocated for livestock
  - Allowance for or restrictions on the construction or maintenance of new structural and nonstructural range improvements{ XE "Range Improvement" }

4.11.3 Nature and Type of Impacts

Under Alternatives A, C, D, and E, which include continued grazing on GSENM, there is the potential for direct and indirect adverse impacts on historic properties. There may also be direct and indirect impacts or adverse effects from future implementation of management actions. An example of these actions is making specific range improvements{ XE "Range Improvement" }, although these would require additional environmental review under NEPA{ XE "National Environmental Policy Act (NEPA)" } and the NHPA{ XE "National Historic Preservation Act (NHPA)" }.

Impacts under NEPA{ XE "National Environmental Policy Act (NEPA)" } are difficult to quantify for the following reasons:

- Only 7 percent of the planning has been subject to Class III archaeological surveys; therefore, the locations of most historic properties are unknown.
- An assessment of most known historic properties is limited to brief surface evaluations.
- Monitoring known historic properties is labor intensive, given the scale of the planning area and the number, complexity, and diversity of cultural resources.
- Planning-level alternatives typically do not identify specific areas for surface-disturbing activities.

Any activities that would involve surface disturbance could have direct and indirect impacts or adverse effects on historic properties, including damaging, destroying, or displacing artifacts and features and constructing modern features out of character with historic settings. Damaging,

displacing, or destroying historic properties could include removing artifacts from their situational context, breaking artifacts, or shifting, obliterating, or excavating features without appropriate scientific recording. Increases in visitors to cultural resources could exacerbate these impacts.

Indirect adverse impacts on historic properties could include those that change the character of a property's use or physical features in a property's setting that contribute to its historic significance (e.g., isolating the property from its setting). Other indirect adverse effect could result from introducing visual, atmospheric, or audible elements that diminish the integrity of the property's historic features. They may also come from erosion exacerbated by increased visits to, or excessive grazing on or near, NRHP{ XE "National Register of Historic Places (NRHP)" }-eligible resources.

Potential impacts under NEPA{ XE "National Environmental Policy Act (NEPA)" } on cultural resources and their settings from subsequent undertakings would be addressed at the project design and implementation phase. If previously undiscovered cultural resources were identified during an undertaking, work would be suspended{ XE "Suspension" } while the resource is evaluated for its eligibility. If the agency official (NPS or BLM, with concurrence from the Utah State Historic Preservation Office{ XE "State Historic Preservation Office (SHPO)" }r [SHPO]) deemed it eligible, it could be avoided or mitigated in order to minimize further impacts.

Consultation would continue with Native American and other groups to identify any TCPs{ XE "Traditional Cultural Property (TCP)" } to avoid, minimize, or resolve impacts.

4.11.4 Direct and Indirect Impacts

Impacts Common to Alternatives A, C, D, and E

Approximately 7 percent of the decision area has been comprehensively inventoried (Class III) for cultural resources and historic properties. As such, potential impacts under NEPA{ XE "National Environmental Policy Act (NEPA)" } on historic properties are considered broadly, with the acknowledgment that there are both documented and unidentified cultural resources in the planning area. Potential acres under grazing and AUMs provide the general proxy for actual case-by-case analyses of possible direct and indirect impacts from potential land use allocations, management actions, and allowable uses described in this MMP{ XE "Monument Management Plan, Grand Staircase-Escalante National Monument (MMP 2000)" }-A/EIS. These include whether an area would be open or closed to grazing, whether there would be seasonal restrictions, or whether a broad array of structural or nonstructural range improvements{ XE "Range Improvement" } would be allowable, given resource constraints and other management directives.

Grazing has the potential for adverse impacts on historic properties under Alternatives A, C, D, and E. This is because the NPS and BLM have identified grazing-related impacts on NRHP{ XE "National Register of Historic Places (NRHP)" }-eligible resources in the decision area. The BLM and NPS have highlighted certain types of historic properties as especially sensitive, when accessible to livestock. Examples are as follows:

- Rock shelters where cattle tend to congregate

- Sites with standing prehistoric or historic architecture
- Open sites in sensitive locations, such as those on or near erosive soils or riparian areas{ XE "Riparian Area" } containing easily damaged resources or archaeological features
- Rock art sites, including areas of prehistoric and historic significance

Overall direct and indirect impacts or adverse effects in these areas are tied to a site's accessibility and its relationship to water, salt licks, natural shelters, fence lines, cattle trails, two-tracks, or other features known to concentrate livestock. In addition, range improvements{ XE "Range Improvement" }, whether implemented to benefit cattle or not, have the potential for impacts or adverse effects on historic properties. This would be the case when comprehensive cultural resource inventories or consultation with Native Americans or other groups have not been conducted and resources have not been adequately identified, delineated, and documented.

Direct impacts or adverse effects from grazing or related activities under any of the action alternatives could include the following:

- Trampling artifacts or features
- Rubbing or leaning on standing architecture or rock art
- Installing range features, such as fences, stock tanks, or corrals within the boundaries of a historic property
- Implementing range improvements{ XE "Range Improvement" }, such as ground-disturbing activities associated with vegetation management within the boundaries of historic properties or in proximity, so as to concentrate livestock

Any of these could be considered under both potential short- and long-term impacts or adverse effects, although any definitive assessment would have to be analyzed on a site-by-site basis.

Examples of indirect impacts or adverse effects from grazing or related activities include the following:

- Denuding soils by overgrazing, resulting in increased erosion on archaeological sites
- Increasing fugitive dust and resulting impacts on rock art panels from overgrazing and vehicle use associated with ranching activities
- Concentrating livestock in the vicinity of water sources and other geographic features that are also correlated to higher concentrations of historic properties
- Contaminating soils, archaeological deposits, and features from exposure to animal waste and urine

Under Alternatives A, C, D, and E, the NPS and the BLM would adopt a formal cultural resources management protocol (**Appendix C**), which would be covered in a programmatic agreement between GSENM and Glen Canyon. This agreement document (**Appendix E**) would

provide the framework and guidance for resolving future grazing and range improvement{ XE "Range Improvement" } impacts or adverse effects on historic properties, should Alternatives A, C, D, or E be selected. The programmatic agreement is under development and will be completed in time to be considered with the final EIS.

Long-term impacts on cultural resources may be mitigated by implementing range improvements{ XE "Range Improvement" } such as piping water away from historic properties accessible to cattle, blocking livestock access with natural materials, and fencing sensitive resources, such as archaeological sites, standing architecture, and rock alcoves.

While maximum permitted AUMs vary across alternatives, the density of average actual use AUMs only varies slightly, between 49 and 52 acres available per AUM. There are 52 acres available per AUM under Alternative E, 51 acres available per AUM for Alternative A, 50 acres available per AUM for Alternative D, and 49 acres available per AUM for Alternative C. The density of active use per AUM would vary between 20 acres (Alternative D) and 27 acres (Alternatives A and E). Alternative C would have a density of 26 acres per AUM under active use.

Current trends and future modeling of climate change indicate that more extreme weather patterns would occur throughout the desert Southwest and GSENM. This pattern could exacerbate the alteration, deterioration, or complete loss of certain types of cultural resources, at variable rates, depending on location, materials, deposits, and many other site- and artifact-specific elements. For example, a prehistoric lithic scatter that has been exposed for 10,000 years and has experienced many fluctuations in moisture, exposure to sunlight, and heat and cold would likely not be measurably impacted, depending on its location; however, more intensive weathering and exposure to greater climactic fluctuations may significantly deteriorate a historic cabin, an ancestral puebloan site with organic features and artifacts, rock-art panels, and sites that may be located along an intermittent or perennial{ XE "Perennial" } watercourse. Because of this, these types of prehistoric and historic resources in GSENM are likely to be impacted as climate change intensifies.

Alternative A

Under Alternative A, the NPS and BLM would continue the current management direction contained in the 2000 MMP{ XE "Monument Management Plan, Grand Staircase-Escalante National Monument (MMP 2000)" }, the four 1981 BLM MFPs, as amended, and the 1999 GzMP{ XE "Grazing Management Plan, Glen Canyon (GzMP 1999)" } for Glen Canyon. Existing policy and guidance, such as regulations (specifically 43 CFR, Part 4100, Grazing Administration), BLM Manuals, NPS Director's Orders, and NPS Management Policies, would also be followed. Livestock grazing would continue at the current permitted levels, and areas currently unavailable would remain unavailable for livestock grazing. Also, both structural and nonstructural range improvements{ XE "Range Improvement" } consistent with the MFPs and MMP would be considered within the decision area; however, certain structural features, such as new line cabins, would not be allowed in Glen Canyon.

In total, 2,089,000 acres would be available for livestock grazing; 153,000 acres would remain unavailable. Permitted AUMs would continue at their existing levels, with 76,957 active AUMs. The density of livestock grazing would be 27 acres per active AUM and 51 acres per AUM,

based on average actual use. Combined with acres available for livestock grazing and structural and nonstructural range improvements{ XE "Range Improvement" } as summarized under *Impacts Common to Alternatives A, C, D, and E*, above; however, these potential impacts may be minimized with the adoption of the Cultural Resources Management Protocol (**Appendix C**).

Alternative B

Under Alternative B, the BLM and NPS would discontinue livestock grazing in GSENM and Glen Canyon, for a total of 2,242,000 acres. In addition, livestock grazing would be discontinued in allotments within the KFO and ASFO, where GSENM has livestock grazing administration responsibility. Permittees would be given 2 years' notification before the permits are canceled (43 CFR, Subpart 4110.4-2[b]) and would be provided reasonable compensation for any improvements they have placed or constructed (43 CFR, Subpart, 4120.3-6[c]).

Vegetation treatments{ XE "Vegetation Treatment" } for the purposes of improving land health, wildlife habitat, or natural communities, reducing weeds, or stabilizing historic properties may still occur, under existing decisions in the MMP{ XE "Monument Management Plan, Grand Staircase-Escalante National Monument (MMP 2000)" } and Glen Canyon GMP{ XE "General Management Plan, Glen Canyon (GMP 1979)" }. Nonstructural range improvements{ XE "Range Improvement" } would not be maintained for livestock forage, because grazing would be discontinued under Alternative B. Existing structural range improvements would be evaluated on a case-by-case basis for their utility, potential eligibility for listing on the NRHP{ XE "National Register of Historic Places (NRHP)" }, and priority for removal. Most structural range improvements would be removed, unless they are needed to meet objectives for natural resources or protection under the NHPA{ XE "National Historic Preservation Act (NHPA)" }.

Acres available for livestock grazing and AUMs serve as a proxy for potential impacts or adverse effects on historic properties. Because of this, Alternative B would be expected to eliminate grazing-related impacts or adverse effects on historic properties throughout the decision area, when compared with Alternatives A. However, removing past range improvements{ XE "Range Improvement" } associated with Alternative B may involve ground-disturbing activities that could impact historic properties, either directly or indirectly.

In addition, if a cultural landscape, TCP{ XE "Traditional Cultural Property (TCP)" }, or other historic property, where ranching is a core element of its historic significance, were to be defined and accepted for listing on the NRHP{ XE "National Register of Historic Places (NRHP)" }, certain actions could be considered an adverse effect under Section 106 of the NHPA{ XE "National Historic Preservation Act (NHPA)" }. An example of these actions is removing ranching from the decision area, along with cattle, stock tanks, windmill-pump waters, fence lines, corrals, trails, and other ranching-related resources.

Alternative C

Alternative C emphasizes management that prioritizes native species diversity and ecological processes. Acres available for livestock grazing would also be reduced to 1,619,700, and there would be an increase in the number of acres unavailable for livestock grazing (622,300 unavailable acres, which includes 150,200 acres of Glen Canyon). This would be a reduction in available acres, compared with Alternative A. There would be 63,144 active AUMs (18 percent decrease, compared with Alternative A). The density of livestock grazing would be 26 acres per

active AUM and 49 acres per AUM, based on average actual use. Also, both structural and nonstructural range improvements{ XE "Range Improvement" }, consistent with the MFPs and MMP{ XE "Monument Management Plan, Grand Staircase-Escalante National Monument (MMP 2000)" }, would be considered in the decision area; however, certain structural features, such as new line cabins, would not be allowed in Glen Canyon.

As acres available for livestock grazing and AUMs serve as a general proxy for potential impacts or adverse effects on historic properties, Alternative C would be expected to reduce grazing-related impacts or adverse effects on historic properties throughout the decision area, when compared with Alternative A. However, potential structural and nonstructural range improvements{ XE "Range Improvement" } associated with Alternative C involving ground-disturbing activities may impact historic properties, either directly or indirectly. Potential direct and indirect impacts or adverse effects under Alternative C are summarized under *Impacts Common to Alternatives A, C, D, and E*, above; however, these potential impacts may be minimized with the adoption of the Cultural Resources Management Protocol (**Appendix C**).

Alternative D

Under Alternative D, 2,135,200 acres would be available for livestock grazing; 106,800 acres would be unavailable, which includes 90,300 acres in Glen Canyon. There would be 107,955 active AUMs, and projected average actual use would be 42,885 AUMs, a 40 and 4 percent increase in AUMs, respectively, compared with Alternative A. The density of livestock grazing would be 20 acres per active AUM and 50 acres per AUM, based on average actual use. Also, both structural and nonstructural range improvements{ XE "Range Improvement" } would be considered in the decision area, including new line cabins in Glen Canyon in locations outside of proposed wilderness areas.

Using acres available for livestock grazing and AUMs as a general proxy for potential impacts or adverse effects on historic properties, Alternative D would likely have grazing-related impacts or adverse effects on historic properties throughout the decision area. This would be similar to those under Alternative A. However, the number of active AUMs would increase by 40 percent, compared with Alternative A; this would increase the number of livestock on the landscape and their density, thereby increasing the probability of impacts on historic properties.

In addition, some sites that are not now grazed would be open to grazing under Alternative D, so they could be open to new grazing-related impacts not experienced under Alternative A. Potential direct and indirect impacts or adverse effects under Alternative D are summarized under *Impacts Common to Alternatives A, C, D, and E*, above; however, these potential impacts may be minimized with the adoption of the Cultural Resources Management Protocol (**Appendix C**).

Alternative E

Under Alternative E, 2,065,300 acres would be available for livestock grazing; 176,700 acres would be unavailable, which includes 95,300 acres in Glen Canyon. There would be 76,520 active AUMs, or 437 fewer than under Alternative A (1 percent decrease). The projected average actual use would be 1,243 AUMs fewer than those under Alternative A. The density of livestock grazing would be 27 acres per active AUM and 52 acres per AUM, based on average actual use. Also, both structural and nonstructural range improvements{ XE "Range

Improvement" **}** consistent with the MFPs and MMP**{** XE "Monument Management Plan, Grand Staircase-Escalante National Monument (MMP 2000)" **}** would be considered within the decision area; however, certain structural features, such as new line cabins, would not be allowed in Glen Canyon.

Using acres available for livestock grazing and AUMs as a general proxy for potential impacts or adverse effects on historic properties, Alternative E could result in a slight decrease of grazing-related impacts or adverse effects on historic properties throughout the decision area, when compared with Alternatives A. Potential direct and indirect impacts under Alternative E are summarized under *Impacts Common to Alternatives A, C, D, and E*, above; however, these potential impacts may be minimized with the adoption of the Cultural Resources Management Protocol (**Appendix C**).

4.11.5 Cumulative Impacts

The cumulative impacts analysis for historic properties is centered on the broader planning area, as summarized in **Section 4.2**, Cumulative Impacts, and **Table 4-1**.

The BLM's decision to issue grazing leases**{** XE "Lease, Grazing" **}** could have indirect impacts on the environment. This is because issuing grazing leases is a commitment of range and other resources for potential future use. Specific structural and nonstructural range improvements**{** XE "Range Improvement" **}** would be subject to environmental review under NEPA**{** XE "National Environmental Policy Act (NEPA)" **}** and Section 106 of the NHPA**{** XE "National Historic Preservation Act (NHPA)" **}**. This would be the case whether the improvement was deemed significant or not. It is reasonable, therefore, to foresee that on-the-ground impacts or adverse effects on historic properties may occur if the BLM and NPS consent to continue grazing in the decision area under this MMP**{** XE "Monument Management Plan, Grand Staircase-Escalante National Monument (MMP 2000)" **}**-A/EIS.

Past and present activities that have had cumulative impacts under NEPA**{** XE "National Environmental Policy Act (NEPA)" **}** include mining, ranching, timber cutting, road building, off-road vehicle riding, and dispersed camping, including in sensitive areas such as rock shelters and other areas known to have higher concentrations of cultural resources. However, certain activities and infrastructure installed in the decision area prior to NEPA and NHPA**{** XE "National Historic Preservation Act (NHPA)" **}**, such as grazing-related corrals, fences, stock tanks, and trails, and mining, that may have impacted other cultural resources in the past, may now be considered historic properties themselves. In addition, land exchanges, such as the 1997 acquisition of 180,000 acres of State Trust Lands in GSENM, brought more lands under federal oversight and consequently led to greater protection of other historic properties.

Reasonably foreseeable future actions are the proposed Lake Powell Pipeline and three hydroelectric power facilities that would likely have direct, indirect, and cumulative impacts under NEPA**{** XE "National Environmental Policy Act (NEPA)" **}** on historic properties. Specifically, they could have direct impacts by siting infrastructure within the boundaries of NRHP**{** XE "National Register of Historic Places (NRHP)" **}**-eligible resources or within the viewshed of TCPs**{** XE "Traditional Cultural Property (TCP)" **}** or other sensitive sites. Indirect impacts may include fugitive dust, erosion, and increased access, leading to vandalism or illegal collecting. Other reasonably foreseeable actions are potential fire management activities,

vegetation management, transmission lines, and recreation-based development, all of which have the potential to impact historic properties. In addition, if a cultural landscape, TCP, or other historic property, where ranching is a core element of its historic significance, were to be defined and accepted for listing on the NRHP, certain actions could be considered an adverse effect under Section 106 of the NHPA{ XE "National Historic Preservation Act (NHPA)" }. An example of these actions is removing ranching from the decision area, along with cattle, stock tanks, windmill-pump waters, fence lines, corrals, trails, and other ranching-related resources.

Incremental cumulative impacts under NEPA{ XE "National Environmental Policy Act (NEPA)" } are not anticipated under Alternative B, because the decision area would be unavailable for livestock grazing. Under Alternatives A, C, D, and E, there would likely be incremental cumulative or adverse effects on historic properties, such as from the following:

- Cattle trampling artifacts and features
- Concentrating livestock in sensitive areas containing higher numbers of prehistoric and historic cultural resources
- Animal waste and urine causing chemical changes to archaeological deposits
- Fugitive dust, erosion, and other possible indirect cumulative impacts

However, under each of these alternatives, impacts or adverse effects may be minimized with the adoption of the Cultural Resources Management Protocol (**Appendix C**). Further, any ground disturbance, such as structural range improvements{ XE "Range Improvement" } would require further decision-making under NEPA{ XE "National Environmental Policy Act (NEPA)" }. These additional actions and analyses would involve a wide variety of factors; examples are the nature of the undertaking, policy initiatives about timing of actions, the presence of absence of sensitive or significant resources, the protection of said resources, whether any applications are submitted or any funding is available, and compliance with other authorities and policies. The use of BMPs and the Cultural Resources Management Protocol (**Appendix C**) should minimize impacts on historic properties, as should individual analyses under NEPA and Section 106 of the NHPA{ XE "National Historic Preservation Act (NHPA)" } that would determine project-specific direct, indirect, and cumulative impacts.

4.11.6 References

NPS (United States Department of the Interior, National Park Service). 1998. Cultural Resource Management Guideline. NPS-28. Internet website: https://www.nps.gov/parkhistory/online_books/nps28/28contents.htm.

NPS (United States Department of the Interior, National Park Service). 2002. How to Apply the National Register Criteria for Evaluation. National Register Bulletin 15. Internet website: https://www.nps.gov/NR/PUBLICATIONS/bulletins/pdfs/nrb15.pdf.

Parker, P. L. and T. F. King. 1998. Guidelines for Evaluating and Documenting Traditional Cultural Properties. National Register Bulletin 38. Internet website: https://www.nps.gov/nr/publications/bulletins/pdfs/nrb38.pdf.

Zweifel, M. 2016. Draft Cultural Resource Site Condition and Trend Analysis: Results of 2013-2015 Grazing Allotment Inventory and Monitoring Grand Staircase-Escalante National Monument. Unpublished BLM GSENM Report, not for public release.

4.12 Paleontological Resources

In general, no impacts on paleontological resources{ XE "Paleontological Resource" } are anticipated as a result of this MMP{ XE "Monument Management Plan, Grand Staircase-Escalante National Monument (MMP 2000)" }-A. Typically, PFYC maps are used to avoid, minimize, or mitigate impacts on paleontological resources when significant surface-disturbing activities, such as trenching, pipeline installations, or highway construction, are considered. However, because the MMP-A is limited to actions pertaining to livestock grazing, soil mapping is better suited for disclosing impacts on paleontological resources. This is because soil mapping more accurately depicts where thin soils and bedrock could be impacted by livestock grazing and related actions.

A review of the locations where thin soils and bedrock occur demonstrates that these areas are mutually exclusive of where livestock graze or where range improvements{ XE "Range Improvement" } would be made. In order for fossils to occur at the surface, there must be relatively high rates of erosion of bedrock or deep alluvial exposure in high relief areas. In nearly all cases, these areas are sparsely vegetated or unvegetated. As such, these areas are generally exclusive of where livestock prefer to be and where range improvements are made, for example alluvial benches or bottoms.

Additionally, BLM specialists' experience demonstrate that the passing impacts of cattle moving through a badlands area is trivial in regard to impacts on paleontological resources{ XE "Paleontological Resource" }.[1] No instances of significant impacts from such movement are known to have occurred. Further, there is a lack of credible studies demonstrating livestock grazing impacts on paleontological resources.[2]

Further, trampling has never been observed to significantly impact a single vertebrate fossil site.[3] Spring{ XE "Spring" } developments and catchments and cattle guards are almost universally sited in alluvial bottoms; in GSENM, no significant fossils have been documented in alluvial bottoms (Foster et al. 2001), impacts on paleontological resources{ XE "Paleontological Resource" } would not be anticipated.

However, fossil resources in bluff shelters and coves do occur, albeit extremely rare, and nearly all the fossils are coprolite[4] deposits. Bechan Cave is one example, but others occur in Glen Canyon and may occur in GSENM as well (Hunt et al. 2012). In most cases, the resource layers are buried under Holocene sediment, but in rare cases they are at the surface and can be impacted by any ground-disturbing activity. However, impacts from livestock on fossil resources have never been documented in alcoves, although it is hypothetically possible.[5] In such cases, mitigation measures would be to place physical grazing exclosures around such sites or to

[1] Alan Titus, BLM, personal communication with Matt Betenson, BLM, April 14, 2016
[2] James Kirkland, State of Utah, personal communication via e-mail with Nicholas Parker, EMPSi, January 17, 2017
[3] James Kirkland, State of Utah, personal communication via e-mail with Nicholas Parker, EMPSi, January 17, 2017
[4] Fossilized dung
[5] Alan Titus, BLM, personal communication via e-mail with Nicholas Parker, EMPSi, January 17, 2017

amend allotments to keep livestock out of the sensitive areas. This assessment is applicable to all grazing-related alternatives (A, C, D, and E) and results from conceptual GIS-mapping exercises and the professional judgment of BLM resource specialists and the Utah State Paleontologist.

Current trends and future modeling of climate change indicate that more extreme weather patterns would occur throughout the desert Southwest and GSENM. This pattern could exacerbate the alteration, deterioration, or complete loss of certain paleontological resources**{** XE "Paleontological Resource" **}**, at variable rates, depending on location, scale, depth of deposit, parent rock, and many other site- and fossil-specific elements. Because of this, important and potentially unique fossil resources in GSENM could be impacted as climate change intensifies.

4.12.1 References

Foster, John, Alan Titus, Gustav Winterfeld, Martha Hayden, and Alden Hamblin. 2001. Grand Staircase-Escalante National Monument, Garfield and Kane Counties, Utah. Special Study 99, Utah Geological Survey. Prepared for the Bureau of Land Management.

Hunt, A. P., V. L. Santucci, J. S. Tweet, and S. G. Lucas. 2012. "Vertebrate coprolites and other bromalites in National Park Service areas." *New Mexico Museum of Natural History and Science*, Bulletin 57. Pp. 343-354.

4.13 Visual and Scenic Resources

This section discusses impacts on visual or scenic resources from proposed management actions. Existing conditions are described in **Section 3.11**, Visual Resources. (The NPS uses the term scenic resources, while the BLM uses the term visual resources. For ease of reading, visual resources is used in this section, unless specifically referring to scenic resources in Glen Canyon.)

On NPS-managed land, scenic resources are subject to the NPS nonimpairment standard described in Section 1.4.4 of the NPS Management Policies (NPS 2006). Impairment is a permanent adverse impact. While there cannot be impairment of visual resources, there may still be impacts; however, the level of impact would not be allowed to reach the level of impairment. The types of impacts that could occur are the same on BLM-managed land and NPS-managed land.

4.13.1 Methods of Analysis

The following assumptions are in addition to those listed in **Section 4.1.1**:

- On BLM-managed land, none of the alternatives include changes to the assigned VRM Class objectives; all projects must comply with existing VRM classifications (see **Section 3.11**). VRM class objectives on BLM-managed land would be met through avoidance, proper siting, and project design.
- The visual contrast rating system would be used to influence project design and placement and to analyze site-specific impacts. Projects would be designed to minimize visual impacts by repeating the forms, lines, colors, and textures of the characteristic landscape where the projects are proposed.

- All projects would be planned and designed to meet VRM class objectives. Projects that could not meet VRM objectives would not be authorized.
- Visual resource design techniques and BMPs would be implemented to avoid potentially nonconforming impacts.
- Visual contrast ratings would be required for all proposed projects unless it can be demonstrated that the project is out of view from any possible key observation point. They may also be used for other projects where it would be the most effective design or assessment tool.
- While no impacts on visual resources would occur in areas that are unavailable for grazing, exclusionary fencing may be required to keep livestock from entering those areas. Fencing may impact the quality of visual resources along the perimeter of the unavailable areas; however, fencing can conform to VRM Classes I-IV, if properly designed and implemented.
- It is unlikely that the foreseeable structural or nonstructural range improvements{ XE "Range Improvement" } in the decision area would impact visual resources to such a degree that they would alter or reduce the classification of visual resource values, such as scenic quality, sensitivity, and distance zones. This is because of the requirement to meet existing VRM classes and the typical size, scope, and scale of individual management actions associated with livestock grazing (see *Nature and Type of Impacts*, below, for a detailed discussion). Therefore, the environmental consequences analysis for visual resources is limited to a discussion of VRM classes.

Impacts on visual resources are assessed by identifying the aspects of the alternatives that could create visual impacts and assessing whether VRM class objectives could be met. For example, placing large water catchments in plain view of the casual observer from key observation points would not meet VRM Class I and would likely not meet Class II objectives, whereas using manual techniques to implement a vegetation treatment{ XE "Vegetation Treatment" } could be designed to meet VRM objectives in all management classes.

4.13.2 Factors for Analysis

The factors for analyzing visual resource impacts on BLM-managed lands is their compatibility with the assigned VRM classification, as affected by:

- Changes in acres available for livestock grazing
- Allowances for or restrictions on the construction or maintenance of structural and nonstructural range improvements{ XE "Range Improvement" }

The factors for analyzing visual resource impacts on NPS-managed lands is their compatibility with the NPS management zone are the same as those for BLM-managed lands.

In accordance with NPS policies, scenic resources cannot be impaired in Glen Canyon.

4.13.3 Nature and Type of Impacts

Actions associated with livestock grazing management that could impact visual resources are structural and nonstructural range improvements{ XE "Range Improvement" } that could create contrast in form, line, color, or texture of the characteristic natural landscape.

Nonstructural Range Improvements{ XE "Range Improvement" } (Vegetation Treatments)

Factors influencing the visual impacts of nonstructural range improvements{ XE "Range Improvement" } are the size of treatment, the method of treatment, the type of vegetation treated, and post-treatment revegetation efforts. The larger the size of treatment the more likely it would be to create a change in form, line, color, or texture of the characteristic landscape, to the degree that its contrast would attract the attention of the casual observer.

Larger treatments are likely to be those performed using wheeled mechanical vehicles, prescribed fire, or aerial application of chemicals. Treating larger vegetation, such as trees, is likely to be more noticeable than treating smaller, low-growing vegetation, such as annuals. This is because of the physical structure of the plants. Successful revegetation appropriate for the treated site could, in the long term, blend with the landscape character. Should revegetation not be successful, the lack of vegetation or the establishment of other undesirable plants could create changes in the landscape character.

The NPS would not conduct nonstructural range improvements{ XE "Range Improvement" } to improve forage for livestock; Therefore, the types of impacts discussed in this section would apply only to BLM-managed land.

Impacts from Manual Treatments

Treatment methods using hand labor, manual tools, chainsaws, and other hand-operated power tools are typically limited to covering small areas and are specific to discrete locations and plants. These treatment methods would likely be unnoticeable to the casual observer, due to the small scale of the project areas treated (1 acre or less). These types of nonstructural range improvements{ XE "Range Improvement" } could meet the objectives of all VRM classes if properly designed and implemented.

Impacts from Mechanical Treatments

Wheeled equipment for cutting, chopping, or uprooting vegetation is typically used to treat larger areas. Wheels can create obvious edge lines on the landscape between the treated and untreated areas. Wheeled equipment can be used to kill entire stands of vegetation, which, in the short term, turn from green to brown or gold; in the long term, this often creates unnatural parallel patterns on the landscape for years after implementation. This would be based on the path the vehicle takes, the design of the edges of the treatment area, and how vegetation reestablishes itself, all of which have the potential to attract the attention of the casual observer. These types of nonstructural range improvements{ XE "Range Improvement" } could meet the objectives of VRM Classes II, III, and IV if designed and implemented properly, but they would not meet the objectives of VRM Class I.

Impacts from Chemical Treatments

Nonstructural range improvements{ XE "Range Improvement" } using chemical applications would likely be implemented using boom sprayers or aerial application with aircraft. Boom sprayers mounted to equipment typically are used to treat larger areas and to kill entire stands of vegetation. In the short term, this vegetation turns from green to brown or gold, and in the long term, it often creates unnatural parallel patterns on the landscape. This could endure for years after application, based on the path the vehicle takes and how vegetation reestablishes itself, both of which could attract the casual observer's attention.

Aerial application of chemicals is used to treat large areas. In the short term, it creates obvious edges between the treated and untreated areas, where the texture and color of living (full and green) vegetation contrast with the dead (crumpled and brown) vegetation. It has the potential to attract the attention of the casual observer in the short term. These types of nonstructural range improvements{ XE "Range Improvement" } could meet the objectives of VRM Classes II, III, and IV, if designed and implemented properly, but they would not meet the objectives of VRM Class I.

Impacts from Prescribed Fire

Prescribed fire is also used to treat larger areas. It could create visual contrast in the short term by forming obvious edges between the treated and untreated areas of vegetation. It has the potential to attract the attention of the casual observer in the short term. This type of nonstructural range improvement{ XE "Range Improvement" } could potentially meet the objectives of all VRM classes, if designed and implemented properly so that it mimics natural processes.

Impacts from Revegetation Treatments

Revegetating with live plants or broadcast seeding{ XE "Seeding" } by hand and followed by raking would most likely mimic natural vegetation establishment patterns and create little to no visual contrast. Revegetation using manual methods could meet the objectives of all VRM classes.

Revegetation using drill seeding{ XE "Seeding" } or broadcast seeding, followed by dragging or harrowing, has the potential to create unnatural parallel patterns on the landscape, due to the direction the equipment follows across the land. Revegetation using mechanical methods could meet the objectives of VRM Classes II, III, and IV, if designed and implemented properly, but it would not meet the objectives of VRM Class I.

Table 4-11, Nonstructural Range Improvement{ XE "Range Improvement" } Conformance with VRM Classes (BLM-Managed Lands), details those nonstructural range improvements that would meet VRM class objectives, those that could potentially meet them, and those that would not meet them.

Table 4-11
Nonstructural Range Improvement{ XE "Range Improvement" } Conformance with VRM Classes (BLM-Managed Lands)

Type of Non-Structural Range Improvements{ XE "Range Improvement" } and Method of Treatment	VRM Class I	VRM Class II	VRM Class III	VRM Class IV
Manual treatment (e.g., hand labor, manual tools, and chainsaws)	Potentially	Yes	Yes	Yes
Mechanical treatment (e.g., wheeled equipment that cuts, chops, and uproots)	No	Potentially	Yes	Yes
Chemical treatment (using, for example, boom sprayers and aerial application)	No	Potentially	Yes	Yes
Prescribed fire	Potentially	Yes	Yes	Yes
Revegetation—Mechanical (e.g., drill seeding{ XE "Seeding" } and broadcast seeding, followed by dragging or harrowing)	No	Potentially	Yes	Yes
Revegetation—Manual (e.g., live plants and broadcast seeding{ XE "Seeding" } by hand)	Potentially	Yes	Yes	Yes

Structural Range Improvements{ XE "Range Improvement" **}**

Structural range improvements{ XE "Range Improvement" } may include fences, gates, corrals, cattle guards, stock ponds, water catchments, water pipelines, water troughs, and line cabins. The extent of visual impact related to these types of structural range improvements depends on the siting and design of the various developments.

Fences, gates, and corrals can be constructed of wire, wood, or metal. The thinner and farther apart the construction materials—for example, a barbed-wire fence with t-posts—the more transparent and less obvious the improvement would be; the thicker and more densely spaced the construction materials—such as a corral made with wooden posts and rails—the more obvious it would be. These types of structural range improvement{ XE "Range Improvement" } could potentially meet the objectives of all VRM classes if designed and implemented properly.

Cattle guards are constructed where an opening in a fence line is needed for a road. These are metal grates, flush with the ground, supported by a buried concrete box and metal side wings that are often painted yellow or orange. This type of nonstructural range improvement{ XE "Range Improvement" } could meet the objectives of VRM Classes II, III, and IV, if designed and implemented properly, but it would not meet the objectives of VRM Class I.

Stock ponds are generally constructed in natural drainages or natural depressions by building up berms to trap surface water. This type of nonstructural range improvement{ XE "Range Improvement" } could meet the objectives of VRM Classes II, III, and IV, if designed and implemented properly, but it would not meet the objectives of VRM Class I.

Water catchments (i.e., guzzlers) collect precipitation and store water, and they are of varying sizes. Catchments typically are constructed of a collection apron (concrete or plastic sheeting secured with tires across a broad area), water pipelines, a storage tank, exclosure fencing, and tanks, troughs, or drinkers. These types of structural range improvements{ XE "Range

Improvement" **}**, depending on size and scale, could meet the objectives of VRM Classes II, III, and IV, if designed and implemented properly, but they would not meet the objectives of VRM Class I.

Water developments to provide water for livestock typically include piping water from springs**{** XE "Spring" **}** or wells to a tank or a trough. Pipelines are usually made of black polyethylene and can be either buried or placed on the ground; tanks and troughs can be a variety of sizes and made of plastic, rubber, metal, or concrete. In some instances, water is trucked in to fill up a trough. These types of structural range improvements**{** XE "Range Improvement" **}**, depending on size and scale, could meet the objectives of VRM Classes II, III, and IV, if designed and implemented properly, but they would not meet the objectives of VRM Class I.

Ranchers sometimes use line cabins and camp trailers as housing when moving livestock. These are typically constructed of a variety of materials, including wood, metal, and glass. These types of structural range improvements**{** XE "Range Improvement" **}**, depending on location, size, and scale, could meet the objectives of VRM Classes II, III, and IV, if designed and implemented properly, but they would not meet the objectives of VRM Class I.

Table 4-12, Structural Range Improvement**{** XE "Range Improvement" **}** Conformance with VRM Classes (BLM-Managed Lands), details those structural range improvements that would meet VRM class objectives, those that could potentially meet them, and those that would not meet them. **Table 4-13**, Structural Range Improvement**{** XE "Range Improvement" **}** Conformance with Management Zones (NPS-Managed Lands), details those structural range improvements that would meet the objectives of the NPS management zones, those that could potentially meet them, and those that would not meet them.

Table 4-12
Structural Range Improvement{ XE "Range Improvement" } Conformance with VRM Classes (BLM-Managed Lands)

Type of Structural Range Improvements{ XE "Range Improvement" **}**	**VRM Class I**	**VRM Class II**	**VRM Class III**	**VRM Class IV**
Fences and gates	Potentially	Yes	Yes	Yes
Corrals	Potentially	Yes	Yes	Yes
Cattle guards	No	Yes	Yes	Yes
Stock ponds	No	Yes	Yes	Yes
Water catchments	No	Potentially	Yes	Yes
Water pipelines	No	Yes	Yes	Yes
Water troughs	No	Yes	Yes	Yes
Line cabins	No	Potentially	Yes	Yes

Table 4-13
Structural Range Improvement{ XE "Range Improvement" } Conformance with Management Zones (NPS-Managed Lands)

Type of Structural Range Improvements{ XE "Range Improvement" }	Natural	Recreation and Resource Utilization{ XE "Utilization" }	Development
Fences and gates	Potentially, for the purposes of exclosures and resource protection	Potentially	Potentially
Corrals	No	Potentially	Potentially
Cattle guards	No	Potentially	Potentially
Stock ponds	No	Potentially	Potentially
Water catchments	No	Potentially	Potentially
Water pipelines	No	Potentially	Potentially
Water troughs	No	Potentially	Potentially
Line cabins	No	No under Alternatives A, B, and C; potentially under Alternatives D and E	No under Alternatives A, B, and C; potentially under Alternatives D and E

4.13.4 Direct and Indirect Impacts

Impacts Common to Alternatives A, C, D, and E

As described under *Nature and Type of Impacts*, some nonstructural and structural range improvements{ XE "Range Improvement" }, if designed and implemented properly, could meet the objectives of all VRM classes. However, there are other improvements that would not meet the objectives, especially those objectives for preserving the existing character of the landscape and those for primarily providing for natural ecological changes (VRM Class I).

The nonstructural range improvements{ XE "Range Improvement" } that could be designed to meet the objectives of all VRM classes include manual treatments, prescribed fire, and manual revegetation. The structural range improvements that could be designed to meet the objectives of all VRM classes include fences, gates, and corrals.

The nature and type of impacts of nonstructural and structural range improvements{ XE "Range Improvement" } would be the same under all alternatives; however, the extent of impacts would vary by alternative, according to how many acres are available for livestock grazing in each VRM class.

The following sections describe how impacts would vary according to these acreages.

Alternative A

Table 4-14, Acres Available for Livestock Grazing by BLM VRM Class and NPS Management Zone, Alternative A, describes the acres available for livestock grazing by VRM class for BLM-managed lands and by management zone for NPS-managed lands under Alternative A.

Table 4-14
Acres Available for Livestock Grazing by BLM VRM Class and NPS Management Zone, Alternative A

VRM Class *(BLM-Managed Lands)*	**Acres *(BLM-Managed Lands)***
Class I	819,700
Class II	583,900
Class III	396,000
Class IV	9,600
Management Zone *(NPS-managed lands)*	**Acres *(NPS-managed lands)***
Natural Zone	123,600
Recreation and Resource Utilization{ XE "Utilization" } Zone	93,500
Development Zone	3,700

Source: BLM GIS 2014

Table 4-15, VRM Class Objectives Conformance Acreages by Type of Range Improvement,{ XE "Range Improvement" } Alternative A, describes the acres available for livestock grazing under Alternative A, where a particular range improvement would meet, could potentially meet, or would not meet VRM class objectives.

Some nonstructural range improvements{ XE "Range Improvement" } would not be allowed in certain areas in order to meet VRM objectives. Those include mechanical and chemical treatments in VRM Class I areas, which total 819,700 acres under this alternative. Moreover, some structural range improvements would not be allowed in certain areas in order to meet VRM objectives. Examples are cattle guards, stock ponds, water catchments, water developments, and line cabins in VRM Class I areas, which total 819,700 acres under this alternative.

Table 4-15
VRM Class Objectives Conformance Acreages by Type of Range Improvement,{ XE "Range Improvement" } Alternative A

	Type of Range Improvement{ XE "Range Improvement" **}**	**Would Typically Meet**	**Could Potentially Meet**	**Would Not Meet**
Nonstructural Range	Manual treatments	989,500	819,700	—
	Mechanical treatments	405,600	583,900	819,700
	Chemical treatments	405,600	583,900	819,700

Table 4-15
VRM Class Objectives Conformance Acreages by Type of Range Improvement,{ XE "Range Improvement" } Alternative A

	Type of Range Improvement{ XE "Range Improvement" **}**	**Would Typically Meet**	**Could Potentially Meet**	**Would Not Meet**
	Prescribed fire	989,500	819,700	—
	Revegetation (manual)	989,500	819,700	—
	Revegetation (mechanical)	405,600	583,900	819,700
Structural Range Improvements{ XE "Range	Fences, gates, and corrals	989,500	819,700	—
	Cattle guards	583,900	—	819,700
	Stock ponds	583,900	—	819,700
	Water catchments	405,600	583,900	819,700
	Water developments	583,900	—	819,700
	Line cabins	405,600	583,900	819,700

Source: BLM GIS 2014

In addition to the acres available for livestock grazing described in **Table 4-14** and **Table 4-15**, above, other acres would be unalloted, unavailable, or available for trailing only**{** XE "Trailing Only" **}** or would be in reserve common allotments**{** XE "Reserve Common Allotment" **}**. No range improvements**{** XE "Range Improvement" **}** would be authorized in areas unavailable for livestock grazing (153,000 acres).

Similarly, no range improvements**{** XE "Range Improvement" **}** would be authorized in unalloted areas, so there would be no impacts on visual resources because there is currently no authorized grazing in these areas.

Conversely, range improvements**{** XE "Range Improvement" **}** could be authorized in the 15,700 acres available for trailing only**{** XE "Trailing Only" **}** or the 14,600 acres that are in reserve common allotments**{** XE "Reserve Common Allotment" **}**. Implementing range improvements in these areas would impact visual resources, as described under *Nature and Type of Impacts*. However, range improvements are less likely to be implemented in these areas than in areas that are available for livestock grazing.

Impacts on NPS-managed lands would be similar. The majority of lands available for livestock grazing are in the Natural and Recreation and Resource Utilization**{** XE "Utilization" **}** Zones. No structural range improvements**{** XE "Range Improvement" **}** would be allowed in the Natural Zone, so there would be no impacts on the 123,600 acres available for livestock grazing in this zone. This accounts for just over half of the acres available for livestock grazing in Glen Canyon. Some structural range improvements (see **Table 4-13**, Structural Range Improvement**{** XE "Range Improvement" **}** Conformance with Management Zones (NPS-Managed Lands)), could be allowed in the Recreation and Resource Utilization Zone and there could be impacts on scenic resources where these occur. This accounts for approximately 41 percent of lands available for livestock grazing in Glen Canyon. Finally, any of the structural range improvements could be allowed in the Development Zone and impacts on scenic resources could occur. This accounts for approximately 2 percent of lands available for livestock grazing in Glen Canyon.

Alternative B

Under Alternative B, all lands would be unavailable for livestock grazing. No structural or nonstructural range improvements{ XE "Range Improvement" } would be implemented under this alternative, thus no changes to the existing natural landscape character would occur and VRM objectives would be met.

Under Alternative B, structural range improvements{ XE "Range Improvement" } would be removed unless needed to meet the objectives for natural and cultural resources. Removing range improvement and implementing any necessary reclamation would remove features that potentially contrast with the natural landscape character and return those areas to a natural appearance. Removing unnecessary structural range improvements and implementing reclamation would meet the objectives of all VRM classes and could improve the inventoried scenic quality values. Removing range improvements would also be permissible in all of the NPS management zones and could improve the scenic values.

Under Alternative B, nonstructural range improvements{ XE "Range Improvement" } could be actively reclaimed, using native plant species, or passively reclaimed, allowing native species to reestablish over longer periods. Successful reclamation of nonstructural range improvements could return those areas to a natural appearance. Active reclamation of nonstructural range improvements could meet the objectives of VRM Class II, III, and IV objectives and could improve the inventoried visual values. Passive reclamation of nonstructural range improvements could meet the objectives of all VRM class objectives and could improve the inventoried visual values.

Alternative C

Table 4-16, Acres Available for Livestock Grazing by BLM VRM Class and NPS Management Zone, Alternative C, describes the acres available for livestock grazing by VRM class for BLM-managed lands and by management zone for NPS-managed lands under Alternative C.

Table 4-16
Acres Available for Livestock Grazing by BLM VRM Class and NPS Management Zone, Alternative C

VRM Class *(BLM-Managed Lands)*	**Acres *(BLM-Managed Lands)***	**Percent Change from Alternative A**
Class I	609,700	26% decrease
Class II	497,800	15% decrease
Class III	333,000	16% decrease
Class IV	9,500	1% decrease
Management Zone *(NPS-managed lands)*	**Acres *(NPS-managed lands)***	**Percent Change from Alternative A**
Natural Zone	98,200	21% decrease
Recreation and Resource Utilization{ XE "Utilization" } Zone	57,400	39% decrease
Development Zone	3,700	No change

Source: BLM GIS 2014

Table 4-17, VRM Class Objectives Conformance Acreages by Type of Range Improvement,{ XE "Range Improvement" } Alternative C, describes the acres available for livestock grazing under Alternative C, where a particular range improvement would meet, could potentially meet, or would not meet VRM class objectives.

Some nonstructural range improvements{ XE "Range Improvement" } would not be allowed in certain areas in order to meet VRM objectives. Those include mechanical and chemical treatments in VRM Class I areas, which total 609,700 acres under this alternative.

Some structural range improvements{ XE "Range Improvement" } would not be allowed in certain areas in order to meet VRM objectives. Those include cattle guards, stock ponds, water catchments, water developments, and line cabins in VRM Class I areas, which total 609,700 acres under this alternative.

Table 4-17
VRM Class Objectives Conformance Acreages by Type of Range Improvement,{ XE "Range Improvement" } Alternative C

	Type of Range Improvement{ XE "Range Improvement" }	Would Typically Meet	Would Potentially Meet	Would Not Meet
Nonstructural Range Improvements{ XE "Range	Manual treatments	840,300	609,700	—
	Mechanical treatments	342,500	497,800	609,700
	Chemical treatments	342,500	497,800	609,700
	Prescribed fire	840,300	609,700	—
	Revegetation (manual)	840,300	609,700	—
	Revegetation (mechanical)	342,500	497,800	609,700
Structural Range Improvements{ XE "Range Improvement" }	Fences, gates, and corrals	840,300	609,700	—
	Cattle guards	840,300	—	609,700
	Stock ponds	840,300	—	609,700
	Water catchments	342,500	497,800	609,700
	Water developments	840,300	—	609,700
	Line cabins	342,500	497,800	609,700

Source: BLM GIS 2014

In addition to the acres available for livestock grazing described in **Table 4-16** and **Table 4-17**, above, other acres would be either unavailable or would be available for trailing only{ XE "Trailing Only" }. No range improvements{ XE "Range Improvement" } would be authorized in the 622,300 acres unavailable for livestock grazing; therefore, no impacts on visual resources from livestock grazing would occur in these areas.

Conversely, range improvements{ XE "Range Improvement" } could be authorized in the 15,200 acres available for trailing only{ XE "Trailing Only" }. Making range improvements in trailing only areas would impact visual resources, as described under *Nature and Type of Impacts*. However, range improvements are less likely to be implemented in trailing only areas than in areas that are available for livestock grazing.

Impacts on NPS-managed lands would be similar. The majority of lands available for livestock grazing would be in the Natural and Recreation and Resource Utilization{ XE "Utilization" } Zones. No structural range improvements{ XE "Range Improvement" } would be allowed in the Natural Zone, so there would be no impacts on the 98,200 acres available for livestock grazing in this zone. This accounts for 58 percent of lands available for livestock grazing in Glen Canyon. Some structural range improvements (see **Table 4-13**, Structural Range Improvement{ XE "Range Improvement" } Conformance with Management Zones (NPS-Managed Lands)), could be allowed in the Recreation and Resource Utilization Zone and there could be impacts on scenic resources where these occur. This accounts for approximately 34 percent of lands available for livestock grazing in Glen Canyon. Finally, any of the structural range improvements could be allowed in the Development Zone and impacts on scenic resources could occur. This accounts for approximately 2 percent of lands available for livestock grazing in Glen Canyon.

Alternative D

Table 4-18, Acres Available for Livestock Grazing by BLM VRM Class and NPS Management Zone, Alternative D, describes the acres available for livestock grazing by VRM class for BLM-managed lands and by management zone for NPS-managed lands under Alternative D.

Table 4-18
Acres Available for Livestock Grazing by BLM VRM Class and NPS Management Zone, Alternative D

VRM Class *(BLM-Managed Lands)*	Acres *(BLM-Managed Lands)*	Percent Change from Alternative A
Class I	878,300	7% increase
Class II	606,000	4% increase
Class III	411,300	4% increase
Class IV	9,600	No change
Management Zone *(NPS-managed lands)*	**Acres *(NPS-managed lands)***	**Percent Change from Alternative A**
Natural Zone	122,000	1% decrease
Recreation and Resource Utilization{ XE "Utilization" } Zone	93,500	No change
Development Zone	3,700	No change

Source: BLM GIS 2014

Table 4-19, VRM Class Objectives Conformance Acreages by Type of Range Improvement,{ XE "Range Improvement" } Alternative D, describes the acres available for livestock grazing under Alternative D, where a particular range improvement would meet, would potentially meet, or would not meet VRM class objectives.

Some nonstructural range improvements{ XE "Range Improvement" } would not be allowed in certain areas in order to meet VRM objectives. Those include mechanical and chemical treatments in VRM Class I areas, which total 878,300 acres under this alternative.

Some structural range improvements{ XE "Range Improvement" } would not be allowed in certain areas in order to meet VRM objectives. Those include cattle guards, stock ponds, water

catchments, water developments, and line cabins in VRM Class I areas, which total 878,300 acres under this alternative.

Under Alternative D, 106,800 acres would be unavailable for livestock grazing, thus there would be no impacts on visual resources from grazing.

Table 4-19
VRM Class Objectives Conformance Acreages by Type of Range Improvement,{ XE "Range Improvement" } Alternative D

	Type of Range Improvement{ XE "Range Improvement" }	Would Likely Meet	Would Potentially Meet	Would Not Meet
Nonstructural Range Improvements{ XE "Range	Manual treatments	1,026,900	878,300	—
	Mechanical treatments	420,900	606,000	878,300
	Chemical treatments	420,900	606000	878,300
	Prescribed fire	1,026,900	878,300	—
	Revegetation, manual	1,026,900	878,300	—
	Revegetation (mechanical)	420,900	606,000	878,300
Structural Range Improvements{ XE "Range Improvement" }	Fences, gates, and corrals	1,026,900	878,300	—
	Cattle guards	1,026,900	—	878,300
	Stock ponds	1,026,900	—	878,300
	Water catchments	420,900	606,000	878,300
	Water developments	1,026,900	—	878,300
	Line cabins	420,900	606,000	878,300

Source: BLM GIS 2014

Impacts on NPS-managed lands would be similar to Alternative A. There would be no change in acres available for grazing in the Development Zone and the Recreation and Resource Utilization{ XE "Utilization" } Zone. There would be a slight decrease in the acres available for grazing in the Natural Zone and there would be no impacts on scenic resources in this area.

Alternative E

Table 4-20, Acres Available for Livestock Grazing by BLM VRM Class and NPS Management Zone, Alternative E, describes the acres available for livestock grazing by VRM class for BLM-managed lands and by management zones for NPS-managed lands under Alternative E.

Table 4-20
Acres Available for Livestock Grazing by BLM VRM Class and NPS Management Zone, Alternative E

VRM Class *(BLM-Managed Lands)*	Acres *(BLM-Managed Lands)*	Percent Change from Alternative A
Class I	820,100	Less than 1% increase
Class II	600,100	3% increase
Class III	396,000	No change
Class IV	9,600	No change

Management Zone (NPS-Managed Lands)	Acres (NPS-Managed Lands)	Percent Change from Alternative A
Natural Zone	117,000	5% decrease
Recreation and Resource Utilization{ XE "Utilization" } Zone	93,500	No change
Development Zone	3,700	No change

Source: BLM GIS 2014

Table 4-21, VRM Class Objectives Conformance Acreages by Type of Range Improvement,**{** XE "Range Improvement" **}** Alternative E, below, describes the acres available for livestock grazing under Alternative E, where a particular range improvement would meet, would could potentially meet, or would not meet VRM class objectives.

Some nonstructural range improvements**{** XE "Range Improvement" **}** would not be allowed in certain areas in order to meet VRM objectives. Those include mechanical and chemical treatments in VRM Class 1 areas, which total 820,100 acres under this alternative. Also, some structural range improvements would not be allowed in certain areas in order to meet VRM objectives. Those include cattle guards, stock ponds, water catchments, water developments, and line cabins in VRM Class 1 areas, which total 820,100 acres under this alternative.

Table 4-21
VRM Class Objectives Conformance Acreages by Type of Range Improvement,{ XE "Range Improvement" } Alternative E

	Type of Range Improvement{ XE "Range Improvement" }	Would Likely Meet	Would Potentially Meet	Would Not Meet
Nonstructural Range Improvements{ XE "Range	Manual treatments	1,005,700	820,100	—
	Mechanical treatments	405,600	600,100	820,100
	Chemical treatments	405,600	600,100	820,100
	Prescribed fire	1,005,700	820,100	—
	Revegetation (manual)	1,005,700	820,100	—
	Revegetation (mechanical)	405,600	600,100	820,100
Structural Range Improvements{ XE "Range Improvement" }	Fences, gates, and corrals	1,005,700	820,100	—
	Cattle guards	1,005,700	—	820,100
	Stock ponds	1,005,700	—	820,100
	Water catchments	405,600	600,100	820,100
	Water developments	1,005,700	—	820,100
	Line cabins	405,600	600,100	820,100

Source: BLM GIS 2014

In addition to the acres available for livestock grazing described in **Table 4-20** and **Table 4-21**, above, other acres would be unavailable or available for trailing only**{** XE "Trailing Only" **}**, or they would be in reserve common allotments**{** XE "Reserve Common Allotment" **}**. No range improvements**{** XE "Range Improvement" **}** would be authorized in the 176,700 acres

unavailable for livestock grazing, so there would be no impacts on visual resources from livestock grazing.

Conversely, range improvements{ XE "Range Improvement" } could be authorized in the 15,200 acres available for trailing only{ XE "Trailing Only" } or the 19,500 acres in reserve common allotments{ XE "Reserve Common Allotment" }. Making range improvements in these areas would impact visual resources, as described under *Nature and Type of Impacts*. However, range improvements are less likely to be implemented in these areas than in areas that are available for livestock grazing.

Impacts on NPS-managed lands would be similar. There are 4,900 acres in reserve common allotments{ XE "Reserve Common Allotment" } in the Natural and Recreation and Resource Utilization{ XE "Utilization" } Zones where structural range improvements{ XE "Range Improvement" } would not occur, so there would be no impacts. The majority of lands available for livestock grazing are in the Natural and Recreation and Resource Utilization Zones. No structural range improvements would be allowed in the Natural Zone, so there would be no impacts on the 117,000 acres available for livestock grazing in this zone. This accounts for 56 percent of lands available for livestock grazing in Glen Canyon. Some structural range improvements (see **Table 4-13**, Structural Range Improvement{ XE "Range Improvement" } Conformance with Management Zones (NPS-Managed Lands)), could be allowed in the Recreation and Resource Utilization Zone and there could be impacts on scenic resources where these occur. Outside of the reserve common allotments, this accounts for approximately 37 percent of lands available for livestock grazing in Glen Canyon. Finally, any of the structural range improvements could be allowed in the Development Zone and impacts on scenic resources could occur. This accounts for approximately 2 percent of lands available for livestock grazing in Glen Canyon.

4.13.5 Cumulative Impacts

The cumulative impacts area of analysis for visual and scenic resources extends beyond the planning area to include viewsheds on the planning area's periphery.

Any ground-disturbing activities that create contrast in form, line, color, or texture of the characteristic landscape can impact visual and scenic resources. Past, present, and reasonably foreseeable future actions (see **Table 4-1**) that have affected visual resources are livestock grazing (nonstructural and structural range improvements{ XE "Range Improvement" }), vegetation and weeds management, highway and road construction and maintenance, communication sites, transmission lines and pipelines, wildfires, and any residential, commercial, industrial, or recreational developments within the cumulative impacts area of analysis.

See *Nature and Type of Impacts* for a description of the impacts on visual resources by nonstructural and structural range improvements{ XE "Range Improvement" }.

Vegetation management for greater sage-grouse{ XE "Greater Sage-Grouse" }, vegetation treatments{ XE "Vegetation Treatment" }, and invasive vegetation management is conducted in the planning area. Removing or disturbing vegetation can create contrast by altering the forms, lines, colors, and textures of the characteristic landscape.

Transmission lines and pipelines create linear features on the landscape and can change its vegetation pattern. Both of these can affect the line and color of the landscape and, in some cases, the landform. Transmission lines and communication sites (cell towers) create vertical features on the landscape, and they commonly create contrasts in form and line with the landforms and vegetation.

Visual resources can be impacted by fire, fire suppression, fuels treatments, and rehabilitation post-fire, when the ground surface is scarred, blackened, and devoid of vegetation. These activities can also result in colors or vegetation patterns or textures that contrast with the surrounding landscape. In the long term, if desired vegetation becomes established and matures, the contrast typically diminishes.

Residential and recreational developments often create contrast in form, line, color, and texture with all landscape character elements (landform, vegetation, and structures).

When actions considered under the alternatives are added to past, present, and reasonably foreseeable future actions, as described above, the alternatives would have cumulative impacts on visual and scenic resources. The results of future VRIs could differ from current VRI classes by combining the projects listed in **Table 4-1** with any of the alternatives. However, the BLM's VRM manual (BLM Manual 8400; BLM 1984) directs it to manage public lands in a manner that will protect the quality of the scenic values of these lands, according to their VRM classification. As described under **Section 4.13.4**, Direct and Indirect Impacts, the BLM would not carry out actions that do not meet VRM objectives, which would also minimize impacts cumulatively.

On NPS-managed lands, vegetation treatments**{** XE "Vegetation Treatment" **}** and structures described in **Table 4-1** could impact scenic resources. These activities would usually not be allowed in the Natural Zone, so there would be no impacts there. In the Recreation and Resource Utilization**{** XE "Utilization" **}** Zone and the Development Zone, any changes to the landscape must conform with the objectives for that zone. The BLM would not carry out actions that do not meet the objectives for the zone, so cumulative impacts would be minimized.

4.13.6 References

BLM (United States Department of the Interior, Bureau of Land Management). 1984. Manual 8400—Visual Resource Management. Rel. 8-24 BLM, Washington, DC. April 5, 1984.

BLM GIS. 2014. Base GIS data on file with the BLM's eGIS server used for calculations or figures to support the MMP**{** XE "Monument Management Plan, Grand Staircase-Escalante National Monument (MMP 2000)" **}**-A. BLM, Grand Staircase Escalante National Monument, Utah.

NPS (United States Department of the Interior, National Park Service). 2006. Management Policies. United States Department of the Interior, National Park Service. Washington, DC. ISBN 0-16-076874-8.

4.14 WILDLAND FIRE MANAGEMENT

This section discusses impacts on wildland fire management from proposed management actions. Existing conditions are described in **Section 3.12**, Wildland Fire Management.

4.14.1 Methods of Analysis

Impacts were determined by assessing which actions, if any, would change the incidence of ignition, fire size, fire intensity, or ability to effectively suppress wildfire or perform fuels treatments. Some impacts are direct, while others are indirect and affect wildfire through a change in another resource. Direct impacts on wildland fire are generally limited to those that impact wildfire suppression, the ability to manage fuels, and/or change the level of ignition sources. Indirect impacts tend to occur over the long term and involve changes to vegetation structure that in turn impact wildfire size, frequency, severity, intensity, and management.

In addition to the assumptions in **Section 4.1.1**, the analysis assumes the following:

- Fire is an important, functional, natural disturbance in many of the ecological systems found in the Decision Area; excluding fire may result in accumulation of fuel, leading to fires with uncharacteristic behavior and impacts.
- A direct relationship exists between fuel load{ XE "Fuel load" }ing and potential wildfire intensity and severity (Rothermel 1983).
- Past management, such as wildfire suppression{ XE "Fire, suppression" }, agricultural and urban conversion of wildlands, and grazing, have contributed to current fire regimes and vegetation condition classes.
- Vegetation treatments can alter fire behavior characteristics, such as the rate of spread and fire intensity and severity (Stephens et al. 2009). The rate of spread directly relates to fire size, with a higher rate of spread indicating a larger fire.
- Fire and fuels management strategies and methods are intended to support protection, maintenance, and enhancement of objectives for vegetation, wildlife habitat, and other resources and the protection of private property and resources next to BLM-administered lands. Restricting treatment strategies and methods would limit the reduction of hazardous fuels.
- As under current conditions, most fire starts in the planning area would be expected to result from natural sources such as lightning. Where human-caused fires occur, a relationship exists between human access and the likelihood of human-caused fires.

4.14.2 Factors for Analysis

Factors for analysis of impacts on wildland fire management are the following:

- An increase or decrease in the chance of wildfire{ XE "Wildland fire" } ignition
- A change in wildfire frequency
- A change in wildfire{ XE "Wildland fire" } size and/or intensity

- Management actions that impact the ability to respond to wildfire or to perform appropriate treatments to manage for wildland fire
- Alteration standing and downed vegetation that results in a substantial shift in the VCCs of the planning area away from or toward historical reference conditions

4.14.3 Nature and Type of Impacts

Livestock grazing can alter fuel characteristics of ecosystems. Primary impacts occur through the reduction of the standing crop of perennial and annual grasses to levels that can reduce fuel loads, fire ignition potential, and spread (Stand et al 2014, Noy-Meir 1995). Davies et al. (2010) suggest that in steppe vegetation, long-term moderate grazing reduces wildfire severity and size, and that grazing can increase the efficiency of fire suppression activities.

Targeted grazing has the potential to be an ecologically and economically sustainable management tool for reduction of fuel loads. Fuel management studies have shown that spread rate and flame length decrease as dry grass fuel loads decrease (Scott and Burgan 2005). Diamond, et. al. (2009) showed that targeted grazing in Idaho reduced Cheatgrass (*Bromus tectorum*) biomass and cover, which resulted in reductions in flame length and rate of spread. When the grazing treatments were repeated on the same plots in May 2006, Cheatgrass biomass and cover were reduced to the point that fires did not carry in the grazed plots in October 2006.

Livestock grazing and the related reduction in fine fuels, can impact the fire return interval. In the long term, reduction in fire frequency can contribute to the increase of woody plants and alter VCC in an area (Archer 1999).

The degree to which livestock grazing would impact fire management**{** XE "Fire management" **}** in the Decision Area is related to the acres available to grazing and forage allocation for livestock; more areas available to grazing and greater livestock allocation generally represent a higher degree of fine fuels reduction and related impacts.

However, how grazing-induced fuel alterations affect wildland fire depends on weather conditions and plant community characteristics. As weather conditions become extreme, the influence of grazing on fire behavior is limited, especially in communities dominated by woody plants (Stand et al 2014). Likewise, long-term impacts to fire regime and vegetative condition class would vary based on site specific conditions.

Changes in acres available for livestock grazing could also change the frequency of wildfire ignitions, as there would be changes in the source of these ignitions, such as vehicles or human presence. A reduction in acres available for livestock grazing, could reduce the human presence and vehicles accessing these areas, thereby reducing the frequency of wildfire ignitions. This impact would likely be limited, however, since most ignitions in the Decision Area have historically occurred from natural causes.

Many different resource uses may introduce additional ignition sources into the planning area. These increase the probability of wildfire and the need for fire suppression. Fire intensity can be

affected by activities that decrease fuel loading, such as vegetation treatments, and activities that alter the composition and structure of vegetation communities.

4.14.4 Direct and Indirect Impacts

Impacts Common to Alternatives A, C, D, and E

While permitted AUMs vary across alternatives, the density of average actual use AUMs only varies slightly, between 49 and 52 acres available per AUM. As a result, the impacts of livestock grazing on fine fuel levels and related fire behavior likely to remain similar across these alternatives at the landscape level. Long-term changes to vegetative condition and related fire behavior would be minimized due to requirements in BLM Utah Standards for Rangeland Health{ XE "Rangeland Health" } and Guidelines for Livestock Grazing Management vegetation productivity and by implementing grazing systems, such as rest-rotation, grazing outside of the time when forage is most susceptible to damage (usually spring{ XE "Spring" }), and reduced use.

Under all Alternatives, the likelihood of human caused ignition in the decision area would be minimally impacted by proposed project activities. This is due to the historically low level of fires from human ignition sources.

Alternative A

Current management would continue and impacts on wildland fire would be the same as those described under the *Nature and Type of Impacts*. As discussed in Chapter 3, the planning area is dominated by Fire Regime Group III, characterized by 35-200 year return intervals and mixed severity fire. Continued livestock grazing would help to control fine fuel levels and aid in the maintenance of the Fire Regime.

Table 4-2, Livestock Grazing Allocations by Vegetation Type, Alternative A, is a summary of acreage-based livestock grazing allocations by Vegetative Condition Class. The area available for grazing is dominated by VCC Ib (945,700 acres including common reserve allotments; 45 percent of area open to grazing). As discussed in Chapter 3, lands in VCC Ib contain vegetation similar to historic conditions. Continued livestock grazing, would help to control fine fuel levels and aid in the maintenance of the VCC class.

An additional 737,400 acres (35 percent of area open to grazing) are classified as VCC IIa/IIb, with moderate departure from historic conditions; and 2,300 acres (less than one percent of area open to grazing) are classified as VCC IIIa, with a high level of departure from historic vegetative conditions. In these areas, and at the site-specific level, alteration to vegetative condition may be need to improve conditions (i.e. reduce level of invasive annual grasses) and lower fire risks. management to increase the potential to meet BLM Utah Rangeland Health Standards (and additional NPS desired vegetation standards in Glen Canyon) would assist in changing vegetative conditions.

In cases of voluntary relinquishment of a grazing permit, the authorized officer would determine if it was appropriate to reissue the permit or allocate forge to uses other than livestock grazing. Long term, some additional acres may be classified as unavailable to grazing resulting in site specific changes to fine fuel levels.

In GSENM, utilization of prescribed fire as a management tool in areas where fire has been documented to historically occur would provide a mechanism to help maintain vegetative condition class similar to historic conditions, particularly when management-ignited fires attempt to simulate natural fire intensity and timing.

In Glen Canyon, allowing use of prescribed fires only for special circumstances, such as to control potentially new invasive exotic species, would limit the ability to utilize this management tool to reduce fuels and maintain current VCC and Fire Regimes.

Table 4-X
Livestock Grazing Allocations by Vegetation Condition Class, Alternative A

VCC*	Available for Grazing	Reserve Common Allotment	Trailing Only{ XE "Trailing Only" }	Unavailable for Grazing	Unalloted
Barren	296,900	6,200	8,900	44,300	2,600
Sparsely Vegetated	57,300	500	1,700	6,500	12,800
VCC IB	938,600	7,100	2,500	57,200	17,100
VCC II A	581,300	300	2,100	18,300	2,100
VCC II B	155,400	400	500	10,500	80
VCC III A	2,300	0	0	60	5
Water	500	0	1	60	5

Source: BLM GIS 2014
*excludes lands classified as burnable agriculture, burnable urban, non-burnable agriculture and non-burnable urban

Alternative B

The discontinuance of livestock grazing in the decision area has the highest potential to impact levels of fine fuels. As discussed under *Nature and Type of Impacts*, livestock grazing has been shown to reduce fine fuels levels in the short term. In the absence of livestock grazing, fine fuels levels are likely to increase, with potential to contribute to a risk of more frequent fires. Impacts would be greatest in areas previously available to grazing, and areas with other factors associated with increased fire frequency, such as the presence of cheatgrass.

The emphasis on passive restoration would allow for the use of natural wildfires to obtain habitat objectives. In the long term, this may contribute to the maintenance of historic fire regimes and vegetative condition classes. However, the lack of prescribed fire as a tool could limit the ability to alter vegetative conditions to meet objectives.

Alternative C

Under Alternative C, the BLM would reduce the acres available for grazing (23 percent reduction, compared with Alternative A) and active AUMs (18 percent reduction from Alternative A). Such reductions in permitted use would result in the short term site specific increase in fine fuels and potential for increased fire frequency, as discussed under Alternative B.

Table 4-3, Livestock Grazing Allocations by Vegetation Type, Alternative C, is a summary of Vegetative Condition Classes under Alternative C. Although total levels available to grazing are reduced as compared to Alternative A, the percentage with VCC class remains relatively consistent. Under Alternative C, approximately 741,000 acres (46 percent of area available to grazing as compared to 45 percent under alternative A) would be within VCC Ib. An additional 590,200 acres (36 percent of area open to grazing as compared to 35 percent under Alternative A) are classified as VCC IIa/IIb, with moderate departure from historic conditions; and 2,300 acres (less than one percent of area open to grazing, same as Alternative A) are classified as VCC IIIa, with a high level of departure from historic vegetative conditions.

In addition, Alternative C ungrazed reference areas would be managed to measure progress toward meeting or achieving the vegetation objectives included under this alternative. Short-term increases in fine fuels and related increase in fire frequency may occur in these areas. In the long term, maintaining stringent objectives for vegetation, including an increase in native plant diversity could improve overall vegetative conditions and land health, and reduce the presence and spread of invasive species, which would assist in the maintenance of vegetative condition classes in historic conditions and reduce alterations to fire frequency as compared to Alternative A. Requirements that the permittee would maintain areas free of noxious and nonnative invasive plant species around structural range improvements would further support this effort.

In cases of voluntary relinquishment of grazing permits, a broader level of criteria would be reviewed to determine if appropriate to classify as unavailable as compared to Alternative A. As a result, additional acres could be made unavailable to grazing in the long term, with further site specific changes to fine fuel levels.

Under Alternative C, the BLM and NPS would prioritize passive restoration and non-chemical methods to prevent nonnative invasive plants**{** XE "Invasive Species" **}** from becoming established or spreading as discussed under Alternative B. Allowing the use of prescribed fire in GSENM to mimic natural fire occurrences would provide a tool to assist in maintenance of fire regime and VCC.

Table 4-X
Livestock Grazing Allocations by Vegetation Condition Class, Alternative C

VCC*	Available for Grazing	Trailing Only{ XE "Trailing Only" }	Unavailable for Grazing
Barren	296,900	8,900	44,300
Sparsely Vegetated	46,100	1,700	6,500
VCC IB	741,000	6,800	270,500
VCC II A	461,800	6,700	150,600
VCC II B	128,400	800	39,700
VCC III A	1,700	60	800
Water	260	1	290

Source: BLM GIS 2014
*excludes lands classified as burnable agriculture, burnable urban, non-burnable agriculture and non-burnable urban

Alternative D

Under Alternative D, the BLM would increase both the acres available for grazing (2 percent increase, compared with Alternative A) and active AUMs (40 percent increase, compared with Alternative A). While there would be more acres available for livestock grazing and also more active AUMs than under Alternative A and although Alternative D would emphasize structural and nonstructural range improvements{ XE "Range Improvement" } that would better distribute livestock, the pattern of livestock use is still likely to be similar to current distribution due to other constraints. As a result, fine fuel levels would remain low, similar to Alternative A, contributing to ability to maintain VCC and fire regime at the landscape level.

Table 4-4, Livestock Grazing Allocations by Vegetation Type, Alternative D, is a summary of acreage-based livestock grazing allocations. Although total levels available to grazing are increased as compared to Alternative A, the percentage with VCC class remains relatively consistent. Under Alternative D, approximately 970,900 acres (45 percent of area available to grazing, same as Alternative A) would be within VCC Ib. An additional 764,700 acres (35 percent, same as Alternative A) are classified as VCC IIa/IIb, with moderate departure from historic conditions; and 2,400 acres (less than one percent of area open to grazing, same as Alternative A) are classified as VCC IIIa, with a high level of departure from historic vegetative conditions.

In cases of voluntary relinquishment of a grazing permit, the authorized officer would determine if it was appropriate to reissue the permit or allocate forge to uses other than livestock grazing as under Alternative A. Preference would be given to permit re-issuance, therefore, additional acres made unavailable to grazing would likely be limited.

Impacts from vegetation management in Glen Canyon would be similar to those described for Alternative A. Impacts from managing the season of use would be similar to those for Alternative A, but Alternative D includes additional measures to control of duration, distribution, and stocking rate{ XE "Stocking Rate" }. Such measures could minimize the impacts of additional grazing and reduce the spread of invasive species, thereby helping maintain VCC and fire regime. There is an increased likelihood, however, that grazing would impact vegetation at the site specific level. As a result, site specific changes to vegetation class and related fire frequency, size and intensity may occur.

A variety of vegetation treatment{ XE "Vegetation Treatment" } methods would be allowed. They would aid in the prevention the establishment or spread of State listed noxious species and other nonnative invasive plants{ XE "Invasive Species" }, limiting any increases in fire frequency.

Impacts from managing nonstructural range improvements{ XE "Range Improvement" } would be the same as those described under Alternative A.

Table 4-X
Livestock Grazing Allocations by Vegetation Condition Class, Alternative D

VCC*	Available for Grazing	Unavailable for Grazing
Barren	296,900	6,200
Sparsely Vegetated	57,300	520
VCC IB	970,900	47,400
VCC II A	603,800	15,300
VCC II B	160,900	7,900
VCC III A	2,400	60
Water	480	60

Source: BLM GIS 2014
*excludes lands classified as burnable agriculture, burnable urban, non-burnable agriculture and non-burnable urban

Alternative E

Under Alternative E, the BLM would reduce the acres available for grazing (1 percent reduction, compared with Alternative A) and active AUMs (1 percent reduction, compared with Alternative A). Impacts of livestock grazing on fine fuels and related fire behavior would be similar to Alternative A, see **Table 4-5**, Livestock Grazing Allocations by Vegetation Type, Alternative E. Under Alternative E, approximately 944,200 acres (46 percent of area available to grazing compared to 45 percent in Alternative A) would be within VCC Ib. An additional 748,210 acres (36 percent, compared to 35 percent in Alternative A) are classified as VCC IIa/IIb, with moderate departure from historic conditions; and 2,200 acres (less than one percent of area open to grazing, same as Alternative A) are classified as VCC IIIa, with a high level of departure from historic vegetative conditions.

Use of ungrazed reference areas would have impacts as described for Alternative C.

Impacts from vegetation management in Glen Canyon would be the similar as those described under Alternative A. The emphasis under this alternative on sustainable yield and improvement in land health, therefore site specific vegetation conditions may be improved in the long term, limiting impacts on fuels and fire behavior as compared to Alterative A.

Impacts from managing nonstructural range improvements{ XE "Range Improvement" } in GSENM would be the same as those described under Alternative D.

Impacts of voluntary relinquishment of permits would be as described under Alternative A.

Table 4-X
Livestock Grazing Allocations by Vegetation Condition Class, Alternative E

VCC*	Available for Grazing	Reserve Common Allotment	Trailing Only{ XE "Trailing Only" }	Unavailable for Grazing
Barren	297,700	7,600	500	44,300
Sparsely Vegetated	57,500	560	160	6,500
VCC IB	934,400	9,800	6,800	57,200
VCC II A	590,300	860	6,700	18,300
VCC II B	156,400	650	780	10,500
VCC III A	2,200	0	60	60
Water	490	0	1	60

Source: BLM GIS 2014
*excludes lands classified as burnable agriculture, burnable urban, non-burnable agriculture and non-burnable urban

4.14.5 Cumulative Impacts

The cumulative impacts analysis area for wildland fire management is the planning area.

Vegetation and fire behavior in the planning area have historically been affected by fire suppression, invasive species{ XE "Invasive Species" } conversion and uncharacteristic native vegetation (such as pinyon-juniper expansion). Depending on the characteristics of the plant community and the type and intensity of grazing, livestock grazing may have also had impacts on fire behavior, particularly as related to fine fuel levels and related fire frequency levels.

Human presence has also likely impacted fire behavior through alteration of vegetation, introduction and spread invasive plants{ XE "Invasive Species" } and noxious weeds, and by introducing sources of ignition{ XE "Noxious Weed" }.

The contribution to cumulative impacts from proposed management under each alternative would parallel the impacts of the alternatives in the general impact analysis, above. In general, management actions under every alternative would result in short-term change to fine fuels and vegetative condition, and potential for long term changes to fire regime or VCC. This would be due to treatment activities, other surface-disturbing and disruptive activities, human-caused disturbances, the presence of livestock grazing, wildlife, threatened or endangered species, and special designations.

The greatest contribution to cumulative impacts would occur under Alternative B, by making BLM-managed lands in the decision area unavailable to grazing, thereby increasing the level of fine fuels. Making lands unavailable may result in changes to grazing levels on private lands in the area, and subsequent impacts to fine fuel levels.

Cumulative impacts from each resource or resource use would be greater on livestock grazing if the cumulative projects were to occur simultaneously.

4.14.6 References

Archer, S. 1999. Woody Plant Encroachment into Southwestern Grasslands and Savannas: Rates, Patterns, and Proximate Causes. pp 13-68 in Ecological Implications of Livestock Herbivory in the West (2nd Edition), Vavra M., W.A. Laycock, and R. D. Pieper (Eds.), *Society for Range Management*, Denver, Colo.

Davies, K. W., J. D. Bates, T. J. Svejcar, and C. S. Boyd. 2010. "Effects of long-term livestock grazing on fuel characteristics in rangelands: An example from the sagebrush steppe." *Rangeland Ecology and Management* 63:662-669.

Diamond J.M., C.A. Call CA, and N. Devoe. 2009. "Effects of targeted cattle grazing on fire behavior of cheatgrass-dominated rangeland in the northern Great Basin, USA". *International Journal of Wildland Fire* 18, 944–950.

Noy-Meir, I. 1995. "Interactive effects of fire and grazing on structure and diversity of Mediterranean grasslands". *Journal of Vegetation Science* 6:701–710.

Rothermel, R. C. 1983. How to Predict the Spread and Intensity of Forest and Range Fires USDA Forest Service. General Technical Report INT-143. Intermountain Forest and Range Experiment Station, Ogden, Utah 84401. June 1983

Scott, J. H. and R. E. Burgan. 2005. Standard fire behavior fuel models: a comprehensive set for use with Rothermel"s surface fire spread model. Gen. Tech. Rep. RMRS-GTR-153. Fort Collins, CO: U.S. Department of Agriculture, Forest Service, Rocky Mountain Research Station. 72 p.

Stephens S.L, J.J. Moghaddas, C. Edminster, C. E. Fieldler, and S. Haase. 2009. "Fire treatment effects on vegetation structure, fuels, and potential fire severity in western US forests." *Ecological Applications* 19: 305–320.

Strand, E. K, K. L. Launchbaugh, R. Limb, and L. A. Torell. 2014. "Livestock grazing effects on fuel loads for wildland fire in sagebrush dominated ecosystems." *Journal of Rangeland Applications* 1(2014):35-57

4.15 Lands with Wilderness Characteristics

This section discusses impacts on lands with wilderness characteristics from proposed management actions. Existing conditions are described in **Section 3.13.1**. Lands with wilderness characteristics are applicable only to BLM-managed lands; therefore, this analysis does not apply to any areas within Glen Canyon.

4.15.1 Methods of Analysis and Assumptions

The MMP{ XE "Monument Management Plan, Grand Staircase-Escalante National Monument (MMP 2000)" } does not provide specific direction for managing lands with wilderness characteristics; however, its direction for management within management zones, along with other pertinent BLM guidance, provide for incidental management of lands with wilderness characteristics. In other words, the management prescriptions are not specifically directed at lands with wilderness characteristics, but their application generally serves to preserve wilderness characteristics.

As described in **Chapter 3**, the majority of lands with wilderness characteristics have been included within the Primitive or Outback Zones (431,400 acres). The remaining lands with wilderness characteristics are included in the front country or passage zones (40,300 acres). Inclusion of over 91 percent of lands with wilderness characteristics within the Primitive and Outback Zones provides incidental management that generally serves to preserve wilderness characteristics. A description of the management zones is provided in **Section 3.5.1**, Recreation.

The scope of this MMP{ XE "Monument Management Plan, Grand Staircase-Escalante National Monument (MMP 2000)" }-A/EIS is limited to management actions that pertain to livestock grazing and activities associated with livestock grazing; therefore, it does not alter the existing management zones. As a result, the assumptions below were used to assess impacts on lands with wilderness characteristics:

- Incidental management, as defined above, of lands with wilderness characteristics will continue via management zones. Where lands with wilderness characteristics overlap the Primitive or Outback Zones, the MMP{ XE "Monument Management

Plan, Grand Staircase-Escalante National Monument (MMP 2000)" } prescriptions for those zones would generally reduce the potential for impacts on wilderness characteristics.

- Because the decisions made in this MMP{ XE "Monument Management Plan, Grand Staircase-Escalante National Monument (MMP 2000)" }-A occur at the planning level and the MMP-A does not authorize any implementation-level actions, site-specific impacts on lands with wilderness characteristics cannot be analyzed. Therefore, this analysis considers impacts on lands with wilderness characteristics at the unit level and not impacts on specific acres within those units.
- Livestock grazing and its associated activities, such as trailing and the construction of range improvements{ XE "Range Improvement" }, tend to be small and site-specific and many are not permanent. Because of this, and relative to the size of lands with wilderness characteristics, livestock grazing and its associated activities typically do not reduce wilderness characteristics to such an extent that they would no longer be present within the unit because the impacts are substantially unnoticeable. **Section 4.15.3**, Nature and Type of Impacts, describes the kinds of impacts on lands with wilderness characteristics that may occur from livestock grazing and its associated activities. Given these impacts and the planning-level decisions considered in this MMP{ XE "Monument Management Plan, Grand Staircase-Escalante National Monument (MMP 2000)" }-A, the analysis in this section describes the magnitude of the nature and type of impacts by alternative. This means that specific impacts cannot be identified, but the potential for impacts to occur can be expressed as more or less likely.
- The BLM will evaluate on a case-by-case basis any proposed structural and nonstructural range improvements{ XE "Range Improvement" } for livestock grazing management. Impacts on lands with wilderness characteristics will be assessed as a part of the NEPA{ XE "National Environmental Policy Act (NEPA)" } analysis for those implementation-level projects; the site-specific EA would include at least one alternative that would protect, enhance, or maintain wilderness characteristics.

4.15.2 Factors for Analysis

The factors for analyzing impacts on lands with wilderness characteristics is the degradation of wilderness characteristics to a level at which the wilderness characteristics would no longer be present in the unit. These factors may be affected by allowances for or restrictions on the construction of new or maintenance of existing structural and nonstructural range improvements{ XE "Range Improvement" } and vehicular access needs related to livestock grazing management.

4.15.3 Nature and Type of Impacts

As described in **Section 3.13.1**, lands with wilderness characteristics are parcels that meet a minimum size requirement (or one of the exception criteria) and that contain naturalness and either outstanding opportunities for solitude or primitive and unconfined recreation. In addition, they may possess supplemental values.

Each characteristic has the potential to be impacted by livestock grazing and its associated activities. With the exception of size, wilderness characteristics tend to be qualitative. They are affected by changes to the landscape, including levels of activities occurring, development, and surrounding land uses.

- Size—Features associated with livestock grazing, such as roads and water pipelines, that bisect lands with wilderness characteristics would reduce a unit's size below the required threshold.
- Naturalness—The naturalness of lands with wilderness characteristics could be changed by actions that would
  - Limit, prohibit, or allow surface disturbance
  - Introduce substantially noticeable structures or other human-made modifications to the landscape
  - Vegetation treatments{ XE "Vegetation Treatment" }

  Livestock grazing and its associated activities can reduce naturalness in any one of these ways. Examples follow.

  - Many structural range improvements{ XE "Range Improvement" } (e.g., troughs, stock ponds, and water pipelines) require surface disturbance in the short term while the improvement is being installed or constructed. Surface disturbances alter the natural condition by introducing forces to the landscape outside of those of nature. For some structural range improvements, such as buried water pipelines, short-term disturbances may be alleviated through site remediation (i.e., by returning disturbed soil and reestablishing comparable vegetative cover) over the long term. For structural range improvements that remain on the surface and therefore cannot be completely remediated over the long term, the area of short-term disturbance may be reduced over the long term through remediation of areas disturbed during installation or construction.

    Additionally, improper livestock management can lessen the perceived naturalness of an area by trampling or over-browsing vegetation and causing channel incision.
  - Structural range improvements{ XE "Range Improvement" }, such as fencing, stock ponds, troughs, and guzzlers, introduce works of human beings that reduce an area's appearance of naturalness. However, in certain cases, hitching posts, fencing, spring{ XE "Spring" } developments, troughs, and stock ponds may be considered substantially unnoticeable (BLM 2012a). Siting may be used to mitigate the noticeability of structural range improvements.
  - Vegetation treatments{ XE "Vegetation Treatment" }, such as nonstructural range improvements{ XE "Range Improvement" }, have the potential to improve or reduce an area's apparent naturalness. Vegetation treatments that improve ecosystem composition, structure, and diversity would

support the overall apparent naturalness of areas. Conversely, vegetation treatments consisting of a monoculture would reduce the area's naturalness by introducing a contrast in vegetation between the treatment area and the surrounding landscape. Often, vegetation treatments result in short-term impacts on naturalness but negligible impacts or improved conditions over the long term.

- Outstanding opportunities for solitude—The ability for visitors to have outstanding opportunities for solitude is impacted by the sights, sounds, and evidence of other people. This factor could be changed by introducing substantially noticeable structures or other human-made modifications to the landscape (see discussion of structural and nonstructural range improvements**{** XE "Range Improvement" **}**, above). Opportunities for solitude would also be changed by actions that would increase or decrease human and vehicle presence. In areas available for livestock grazing, riders, trailing, and the construction or maintenance of range improvements would reduce opportunities for solitude. However, these activities are limited in duration and frequency and would have a very localized impact, especially if there is topographic or vegetative screening. Therefore, while outstanding opportunities for solitude can experience localized, short-term impacts from activities associated with livestock grazing, the reduction is unlikely to occur to such a magnitude that the outstanding opportunity for solitude would no longer be present within the unit as a whole.
- Outstanding opportunities for primitive and unconfined types of recreation—These opportunities would be changed by actions that would allow, prohibit, or limit motorized and mechanized use. Management actions considered under the alternatives are specific to livestock grazing but may indirectly impact an area's recreational setting. **Section 4.7**, Recreation, describes impacts on recreation from livestock grazing and its associated activities in detail. Lands with wilderness characteristics that are available for livestock grazing in the front country, passage, and outback zones would have greater vehicle use associated with livestock management than areas that are unavailable for grazing. This would reduce opportunities for primitive and unconfined recreation in those areas.
- Supplemental values—Supplemental values are not required to be present in order for an area to be identified as lands with wilderness characteristics. Actions that degrade ecological, geological, or other features of scientific, educational, scenic, or historic value would reduce the presence of supplemental values. Livestock grazing and its associated activities have the potential to impact supplemental values. For example, livestock can reduce water quality or trample historic artifacts, which would cause a reduction in those values where they are documented.

4.15.4 Direct and Indirect Impacts

Impacts Common to Alternatives A, C, D, and E

Under these alternatives, a portion of identified lands with wilderness characteristics within the decision area would be available for livestock grazing. Potential impacts on available lands with wilderness characteristics would be as described under *Nature and Type of Impacts*.

Alternative A

Table 4-22, Lands with Wilderness Characteristics by Management Zone and Grazing Allocation, Alternative A (Acres), below, displays acres of lands with wilderness characteristics by management zone that are available and unavailable for livestock grazing under Alternative A.

Table 4-22
Lands with Wilderness Characteristics by Management Zone and Grazing Allocation, Alternative A (Acres)

Allocation/ Management Zone	Available for Grazing	Reserve Common Allotment	Trailing Only{ XE "Trailing Only" }	Unavailable for Grazing	Unalloted	Total
Front country	12,900	0*	0	100	0*	**13,000**
Passage	14,400	0	0	100	100	**14,500**
Outback	147,800	0	0	0	700	**148,500**
Primitive	267,900	1,200	0*	1,900	10,400	**281,400**
Total	**443,100**	**1,200**	**0***	**2,000**	**11,100**	**457,500**

Source: BLM GIS 2014
Notes:
Acres are rounded to the nearest hundred. Totals may not match due to rounding. The Wide Hollow unit is outside of GSENM and therefore is not in a management zone. Under Alternative A, 1,200 acres of the unit would remain available, and 5,700 acres would remain unalloted.
*Fewer than 100 acres

Under Alternative A, 455,400 acres (99 percent) of lands with wilderness characteristics would continue to be available for livestock grazing. Of these available acres, the magnitude of the impacts, which are described under *Nature and Type of Impacts*, would be the greatest on those acres located in the Front Country and Passage Zones, due to the incidental management associated with these zones. Although subject to the same *Nature and Type of Impacts*, acres available for livestock grazing within the Outback and Primitive Zones would receive greater incidental management for the preservation of wilderness characteristics due to their inclusion in these zones, resulting in impacts from livestock grazing of a lower magnitude.

Lands with wilderness characteristics located within reserve common allotments**{** XE "Reserve Common Allotment" **}**, which are included in the acres available for livestock grazing, would experience impacts, as described under *Nature and Type of Impacts*, when those areas are authorized for permittee use. Lands with wilderness characteristics that are available for trailing only**{** XE "Trailing Only" **}** would predominantly experience impacts associated with the presence of cattle and riders during trailing activities; however, certain structural range improvements**{** XE "Range Improvement" **}** may also be authorized within these areas.

While unalloted areas are open to livestock grazing, no grazing is authorized in these areas; therefore, unalloted acres of lands with wilderness characteristics would not presently experience the impacts described under *Nature and Type of Impacts*.

Only 2,000 acres (less than 1 percent) of lands with wilderness characteristics would be unavailable for livestock grazing as a planning-level decision. Impacts described under *Nature and*

Type of Impacts from livestock grazing and its related activities on lands with wilderness characteristics would not occur on these acres.

While the potential for impacts on lands with wilderness characteristics may occur as described above, overall, the magnitude of these impacts from current grazing management is minimal.

Alternative B

Table 4-23, Lands with Wilderness Characteristics by Management Zone and Grazing Allocation, Alternative B (Acres), below, displays acres of lands with wilderness characteristics by management zone that are allocated for livestock grazing under Alternative B.

Under Alternative B, the entire decision area would be made unavailable for livestock grazing after 2 years. During those 2 years of continued grazing, the impacts would be the same as those described under Alternative A. After those 2 years, the discontinuation of grazing would largely eliminate the nature and type of impacts described in **Section 4.15.3**; examples are the presence of livestock, riders, and associated motorized travel and eliminating the need for new structural and nonstructural range improvements**{** XE "Range Improvement" **}** or maintaining those that are existing. Existing structural range improvements would be evaluated for utility, historical significance, or other purposes and would be removed unless needed to meet objectives for natural and cultural resources. After removal is complete, an area's wilderness characteristics would increase.

Table 4-23
Lands with Wilderness Characteristics by Management Zone and Grazing Allocation, Alternative B (Acres)

Allocation/Management Zone	Unavailable for Grazing
Frontcountry	13,000
Passage	148,500
Outback	14,500
Primitive	281,400
Total	457,500

Source: BLM GIS 2014
Notes:
Acres are rounded to the nearest 100. Totals may not match due to rounding.
The Wide Hollow unit is outside of GSENM and therefore is not in a management zone. The entire unit (6,800 acres) would be unavailable under this alternative.

Alternative C

Table 4-24, Lands with Wilderness Characteristics by Management Zone and Grazing Allocation, Alternative C (Acres), below, displays acres of lands with wilderness characteristics by management zone that are available and unavailable for livestock grazing under Alternative C.

Under Alternative C, as compared with Alternative A, fewer acres of lands with wilderness characteristics would be available for livestock grazing (387,600 acres; 15 percent reduction), and more acres would be unavailable for livestock grazing (69,800 acres; nearly 40 times more).

Additionally, lands with wilderness characteristics available for trailing would be reduced to fewer than 100 acres, and no lands with wilderness characteristics would be included in reserve common allotments**{** XE "Reserve Common Allotment" **}**. (the remaining 300 acres of PHMA**{** XE "Priority Habitat Management Area (PHMA)" **}** are on lands not managed by the BLM). Overall, these allocations would serve to directly reduce the magnitude of the nature and types of impacts on lands with wilderness characteristics described in **Section 4.15.3**, as compared with Alternative A.

Table 4-24
Lands with Wilderness Characteristics by Management Zone and Grazing Allocation, Alternative C (Acres)

Allocation/ Management Zone	Available for Grazing	Reserve Common Allotment	Trailing Only{ XE "Trailing Only" }	Unavailable for Grazing	Total
Front country	9,400	0	0*	3,600	**13,000**
Passage	13,700	0	0	800	**14,00**
Outback	144,000	0	0	4,600	**148,500**
Primitive	220,600	0	0	60,800	**281,400**
Total	**387,600**	**0**	**0***	**69,800**	**457,500**

Source: BLM GIS 2014
Notes:
Acres are rounded to the nearest hundred. Totals may not match due to rounding.
The Wide Hollow unit is outside of GSENM and therefore is not in a management zone. Under this alternative, 1,200 acres of the unit would be available and 5,700 acres would be restricted to trailing.
*Fewer than 100 acres

Additionally, as described in **Section 4.3.4**, active AUMs may be suspended**{** XE "Suspension" **}** as a result of management associated with the use of ungrazed reference areas. This would directly reduce the magnitude of the impacts described under *Nature and Type of Impacts* by reducing or eliminating the presence of cattle in some areas. Moreover, it would indirectly reduce the magnitude of the nature and type of impacts during the AUMs suspension, as activities associated with livestock grazing would be reduced or would cease. However, the reduction would be only temporary if the suspended AUMs were restored once indicator thresholds were met.

Alternative D

Table 4-25, Lands with Wilderness Characteristics by Management Zone and Grazing Allocation, Alternative D (Acres), below, displays acres of lands with wilderness characteristics by management zone that are available and unavailable for livestock grazing under Alternative D.

Table 4-25
Lands with Wilderness Characteristics by Management Zone and Grazing Allocation, Alternative D (Acres)

Allocation/ Management Zone	Available for Grazing	Reserve Common Allotment	Trailing Only{ XE "Trailing Only" }	Unavailable for Grazing	Total
Front country	12,900	0	0	100	**13,000**
Passage	14,500	0	0	100	**14,500**
Outback	148,500	0	0	0	**148,500**
Primitive	280,200	0	0	1,100	**281,400**
Total	**456,200**	**0**	**0**	**1,300**	**457,500**

Source: BLM GIS 2014
Notes:
Acres are rounded to the nearest hundred. Totals may not match due to rounding.
The Wide Hollow unit is outside of GSENM and therefore is not in a management zone. The entire unit would be available (6,800 acres) under this alternative.

Under Alternative D, as compared with Alternative A, more acres of lands with wilderness characteristics would be available for livestock grazing (456,200 acres; less than 1 percent increase) and fewer acres would be unavailable for grazing (1,300 acres; 35 percent decrease). No lands with wilderness characteristics would be included in reserve common allotments{ XE "Reserve Common Allotment" } and none would be in areas restricted to trailing. All currently unalloted areas would be allocated as either available or unavailable for livestock grazing. Overall, these allocations would serve to increase the magnitude of the impacts described under *Nature and Type of Impacts* on lands with wilderness characteristics, as compared with Alternative A.

Additionally, Alternative D emphasizes the use of structural and nonstructural range improvements{ XE "Range Improvement" } for the management of livestock, as compared with Alternative A. This aspect of the alternative would increase the relative magnitude of the impacts associated with range improvements, as described under *Nature and Type of Impacts*, on lands with wilderness characteristics.

Alternative E

Table 4-26, Lands with Wilderness Characteristics by Management Zone and Grazing Allocation, Alternative E (Acres), below, displays acres of lands with wilderness characteristics by management zone that are available and unavailable for livestock grazing under Alternative E.

Table 4-26
Lands with Wilderness Characteristics by Management Zone and Grazing Allocation, Alternative E (Acres)

Allocation/ Management Zone	Available for Grazing	Reserve Common Allotment	Trailing Only{ XE "Trailing Only" }	Unavailable for Grazing	Total
Front country	12,900	0*	0*	100	**13,000**

Table 4-26
Lands with Wilderness Characteristics by Management Zone and Grazing Allocation, Alternative E (Acres)

Allocation/ Management Zone	Available for Grazing	Reserve Common Allotment	Trailing Only{ XE "Trailing Only" }	Unavailable for Grazing	Total
Passage	14,500	0	0	100	**14,500**
Outback	148,500	0	0	0	**148,500**
Primitive	278,300	1,200	0	1,900	**281,400**
Total	**454,200**	**1,200**	**0***	**2,000**	**457,500**

Source: BLM GIS 2014
Notes:
Acres are rounded to the nearest hundred. Totals may not match due to rounding.
The Wide Hollow unit is outside of GSENM and therefore is not in a management zone. Under this alternative, 1,200 acres of the unit would be available and 5,700 acres would be restricted to trailing (same as Alternative C).
*Fewer than 100 acres

Under Alternative E, as compared with Alternative A, the same acres of lands with wilderness characteristics would be available for livestock grazing (455,400 acres, which includes reserve common allotments{ XE "Reserve Common Allotment" }) and the same number of acres would be unavailable (2,000 acres). As with Alternative A, reserve common allotments under the alternative would contain 1,200 acres of lands with wilderness characteristics, and fewer than 100 acres would be restricted to trailing. Some previously unalloted areas under Alternative A that contain land with wilderness characteristics would be allotted and available for livestock grazing under Alternative E. This would increase the total acres of lands with wilderness characteristics that are available for that use.

Overall, these allocations would increase the magnitude of impacts, as compared with Alternative A.

4.15.5 Cumulative Impacts

The cumulative impacts analysis area for lands with wilderness characteristics is the planning area.

Lands with wilderness characteristics may be impacted by any past, present, or reasonably foreseeable action (see **Table 4-1**) that reduces an area's wilderness characteristics or the size of the unit. Past MFPs and the GSENM MMP{ XE "Monument Management Plan, Grand Staircase-Escalante National Monument (MMP 2000)" } covering lands with wilderness characteristics within the planning area have either directly or indirectly provided for the management of lands with wilderness characteristics. Moreover, they have altered wilderness characteristics via management actions or land use allocations. Lands with wilderness characteristics are particularly susceptible to infrastructure projects, as these actions have the strong likelihood of reducing an area's naturalness by introducing human-made features. Infrastructure projects that cross units of lands with wilderness characteristic may no longer meet the minimum size requirements.

Most ongoing and reasonably foreseeable infrastructure projects are expected to occur within the Highway 89 utility corridor or along other existing utility corridors or developed rights-of-way. Siting infrastructure facilities in these areas would be unlikely to impair existing wilderness characteristics.

4.15.6 References

BLM (United States Department of the Interior, Bureau of Land Management). 2012a. Manual 6310—Conducting Wilderness Characteristics Inventory on BLM Lands. Rel. 6-129, BLM, Washington, DC. March 15, 2012.

_____. 2012b. Manual 6320—Considering Lands with Wilderness Characteristics in the BLM Land Use Planning Process. Rel. 6-130. BLM, Washington, DC. March 15, 2012.

BLM GIS. 2014. Base GIS data on file with the BLM's eGIS server used for calculations or figures to support the MMP{ XE "Monument Management Plan, Grand Staircase-Escalante National Monument (MMP 2000)" }-A. BLM, Grand Staircase Escalante National Monument, Utah.

4.16 WILD AND SCENIC RIVERS

This section discusses the impacts on wild and scenic rivers (WSRs) from the proposed management actions. Existing conditions are described in **Section 3.14.1**.

4.16.1 Methods of Analysis and Assumptions

This analysis assumes the following:

- Analysis of potential impacts is limited to the study corridors of each suitable WSR segment, generally a 0.25-mile buffer on either side of the stream segment.
- Decisions regarding eligibility and suitability of river segments for designation in the NWSRS were completed during the planning effort for the MMP{ XE "Monument Management Plan, Grand Staircase-Escalante National Monument (MMP 2000)" }. Under the MMP, streams recommended as suitable are managed to protect the resources associated with the stream. This grazing-specific MMP-A does not reevaluate any of the WSR decisions of the MMP.
- All suitable stream segments under consideration for WSR designation will be managed under interim protective measures required by the WSR Act and BLM Manual 6400, Wild and Scenic Rivers – Policy and Program Direction for Identification, Evaluation, Planning, and Management (BLM 2012). The interim protective measures ensure that the values for which these river segments were found eligible and suitable are not compromised until Congress makes a decision regarding WSR designation.
- The BLM would not permit any actions under this MMP{ XE "Monument Management Plan, Grand Staircase-Escalante National Monument (MMP 2000)" }-A that would adversely affect the free-flowing condition of a river segment. Livestock watering directly from a stream or diversions for livestock watering purposes are unlikely to occur in such quantities that the free-flowing eligibility requirement

would no longer be present. Therefore, the impact of livestock grazing and related activities on WSR eligibility criteria is not analyzed in detail.

- Livestock grazing and its associated activities (e.g., trailing and range improvements{ XE "Range Improvement" }) could impact the underlying resources or resource uses that comprise the identified ORVs. However, as described below, livestock grazing and its associated activities are not expected to impact ORVs to the extent that they are no longer present. As such, the following values are not carried forward for detailed analysis:
  - Scenic values—The transient presence of livestock and minor range improvements{ XE "Range Improvement" } are unlikely to impact the existence of this value such that it is no longer in a study corridor as a whole. Therefore, scenery is not a value that is included in impact analysis.
  - Recreational values—The transient presence of livestock and minor range improvements{ XE "Range Improvement" } are unlikely to impact the existence of this value such that a recreational ORV is no longer in a study corridor. Any potential impact on recreation opportunities from the presence of livestock would be site-specific and very short term in duration when both the livestock and recreationists are in the same spot. Likewise, both structural and nonstructural range improvements could have a very localized impact on recreational opportunities. However, impacts from structural range improvements could be mitigated, for example, by installing gates in fencing, and nonstructural improvements, such as vegetation treatments{ XE "Vegetation Treatment" }, would not persist over the long term in a manner that impacts recreational opportunities. Therefore, recreation is not a value that is included in impact analysis.
  - Geologic values—Due to the typical nature of livestock grazing and its associated activities, geologic features, processes, and phenomenon would not be impacted because the scale of those activities is sufficiently small, compared with a river corridor's geologic makeup; thus, no impact on geology is expected, and geology is not a value that is included in the impact analysis. Any site-specific livestock grazing project that includes structural range improvements{ XE "Range Improvement" } that could impact geologic values would be further analyzed for impacts on those geologic values through subsequent NEPA{ XE "National Environmental Policy Act (NEPA)" } analysis.
  - Fish populations and/or habitat—BLM Utah Rangeland Health{ XE "Rangeland Health" } Standard 4 (BLM 1997) requires the agency to apply and comply with water quality standards established by the State of Utah and other relevant federal authorities. This includes ensuring that water quality meets aquatic objectives, which, as a result, serves to protect fish and their habitat. Additionally, BLM Manual 6840 (BLM 2008) directs the BLM to conserve or recover ESA{ XE "Endangered Species Act (ESA)" }-listed species and the ecosystems that they depend on so that ESA protections are no longer needed for these species. The manual also

requires the BLM to initiate proactive conservation measures that reduce or eliminate threats to BLM sensitive species, thereby minimizing the likelihood of and need for listing of these species under the ESA.

Because BLM guidance already requires consideration of water quality and aquatic objectives through its Rangeland Health{ XE "Rangeland Health" } Standards and species conservation through Manual 6840, livestock grazing and its associated activities would not diminish the presence of this value within a river segment. Therefore, fish populations and habitat is not a value that is carried forward into impact analysis. Any site-specific livestock grazing project that includes structural range improvements{ XE "Range Improvement" } and that may possess the potential to impact fish populations or habitat would be further analyzed for impacts on those species' habitat through subsequent project-specific NEPA{ XE "National Environmental Policy Act (NEPA)" } analysis.

– Wildlife populations and/or habitat—The Rangeland Health{ XE "Rangeland Health" } Standards broadly serve to ensure functioning ecosystems persist alongside livestock grazing and its associated activities. Additionally, Manual 6840 directs the BLM to manage for species conservation, as described in the above bullet. By applying the Rangeland Health Standards and Manual 6840, the BLM ensures that values associated with wildlife populations and habitat are not diminished such that they are no longer present within a river segment. Therefore, wildlife populations and habitat are not a value that is carried forward into impact analysis. Any site-specific livestock grazing project that includes structural range improvements{ XE "Range Improvement" } with the potential to impact wildlife populations and habitat would be further analyzed for impacts on those species' habitat through subsequent project-specific NEPA{ XE "National Environmental Policy Act (NEPA)" } analysis.

– Historic and cultural values—Under federal historic preservation laws and regulations and BLM policies, historic resources are to be preserved, which includes protecting them from impacts of livestock grazing and its associated activities. Typically, this involves exclusionary fencing around historic sites or not allowing livestock grazing in that area. Because historic resources are to be managed to avoid being impacted by livestock grazing and its associated activities, historic values are not carried forward into impact analysis.

– Other values—This criterion may include, but is not limited to, hydrological and paleontological resources{ XE "Paleontological Resource" } or scientific study opportunities. Depending on the nature of the value identified, livestock grazing and its associated activities within the same river corridor may either add to or detract from that value. Impacts on these values are analyzed when these values exist in areas open to livestock grazing or trailing.

- The suitability of each eligible river segment for inclusion in the NWSRS is based on the factors described in the BLM's Manual 6400, Section 3.4. Suitability for the eligible waterways within GSENM is discussed in full in Appendix 11 of the Final EIS (BLM 1999). Given the limited scope of this MMP{ XE "Monument Management Plan, Grand Staircase-Escalante National Monument (MMP 2000)" }-A, none of the factors affecting suitability listed in BLM Manual 6400 are implicated by the proposed amendment. As such, the basis for suitability is not a factor for analysis used to assess the impact of livestock grazing activities on WSR segments.
- BLM Manual 6400, 3.6(H) states: "Domestic livestock grazing should be managed to protect identified river values. Existing structures may be maintained. Any new facilities to facilitate livestock management should be unobtrusive so as to maintain the values for which a river was found eligible or suitable" (BLM 2012). The management of livestock grazing and its associated activities in conformance with this guideline will avoid impacts on the eligibility or suitability of river segments identified for inclusion in the WSR System.

4.16.2 Factors for Analysis

Factors for analysis of impacts on river segments that were determined suitable for inclusion in the NWSRS are any actions that would impact that segment's identified ORVs. Within this MMP{ XE "Monument Management Plan, Grand Staircase-Escalante National Monument (MMP 2000)" }-A, livestock grazing and its associated activities are not expected to impact the existence of ORVs, as described in **Section 4.16.1**, Methods of Analysis and Assumptions.

The impact on ORVs can be assessed from the following factors:

- Change to a WSR segment's identified ORVs as affected by
  - Miles of WSR segments that are available and unavailable for livestock grazing
  - Allowance for or restrictions on the construction or maintenance of new structural and nonstructural range improvements{ XE "Range Improvement" }
- Change to the tentative classification (e.g., wild, scenic, or recreational) of a river segment found to be eligible as affected by allowing for or restrictions on the construction or maintenance of new structural and nonstructural range improvements{ XE "Range Improvement" }
- A reduction in a WSR's water quality or quantity to the extent that it would no longer support the ORVs as affected by
  - Miles of WSR segments that are available and unavailable for livestock grazing
  - Allowance for or restricting the construction or maintenance of new structural and nonstructural range improvements{ XE "Range Improvement" }

- Change to a river segment's free-flowing condition as affected by allowing for or restricting the construction or maintenance of new structural range improvements{ XE "Range Improvement" }

4.16.3 Nature and Type of Impacts

Livestock grazing and its associated activities can impact the resources or resource uses underlying an ORV. Livestock can trample soils, increase erosion, and degrade water quality. Structural range improvements{ XE "Range Improvement" } can include water diversions that can affect water quantity in WSR segments. Weirs and dams used to divert water can affect free-flowing conditions. However, given the federal laws, regulations, and policies that are in place to protect the ORVs of WSR segments, no direct or indirect impacts on WSR segments are expected as a result of this MMP{ XE "Monument Management Plan, Grand Staircase-Escalante National Monument (MMP 2000)" }-A.

Although no impacts are expected, the presence of livestock grazing and its associated activities within WSR segments presents a certain inherent risk to impact ORVs in extreme scenarios. For example, a WSR segment may contain a historic ORV, and the historic site that gives rise to the ORV might be managed to exclude livestock by placing exclusionary fencing around the site's perimeter. In extreme circumstances, weather or another activity could damage the fencing such that it is no longer capable of excluding the livestock. Livestock would then be able to access and potentially damage the site, by such activities as trampling artifacts.

Because this scenario is not a foreseeable situation, given existing management guidelines, it cannot be specifically analyzed. However, this example describes a certain inherent risk to WSR values that exists from the presence of livestock grazing and its associated activities within WSR segments. As such, the following impact analysis, using the factors for analysis described in **Section 4.16.2**, focuses on the relative magnitude of the risk of impacts on WSR values occurring.

4.16.4 Direct and Indirect Impacts

Impacts Common to Alternatives A, C, D, and E

There are no impacts common to these alternatives.

Alternative A

Under Alternative A, the BLM would continue to manage 180 miles (69 percent) of suitable WSR corridors as available for livestock grazing, including trailing. The remaining 80 miles of suitable WSRs would be managed as unavailable. In areas managed as available for grazing, impacts from livestock and range improvements{ XE "Range Improvement" } would be consistent with those described in the *Nature and Type of Impacts*. In areas unavailable for grazing, there would be no impacts from grazing management on WSRs.

Alternative B

Under Alternative B, the BLM and NPS would manage 100 percent of the analysis area (2,242,000 acres) as unavailable for grazing. There would be 241 miles of WSRs in areas managed as unavailable for grazing. Removing livestock and associated range improvements{ XE

"Range Improvement" } from the planning area would eliminate the potential for livestock grazing management to affect WSRs.

Alternative C

Compared with Alternative A, Alternative C would reduce the total WSR corridor miles available for livestock grazing by 42 percent. Managing 105 fewer miles of WSR corridors as available for grazing would reduce the potential for livestock and range improvements{ XE "Range Improvement" } to affect the ORVs, water quantity and quality, and free flowing condition of suitable WSRs.

Alternative D

Alternative D would be similar to Alternative A, with the exception that there would be an additional 50 miles of suitable WSRs managed as available for livestock grazing. The potential direct and indirect impacts on WSRs from livestock grazing management would be consistent with those described in *Nature and Type of Impacts*.

Alternative E

Alternative E would result in impacts similar to those under Alternative A, with the exception that there would be 20 fewer miles of suitable WSRs managed as available for livestock grazing. The potential direct and indirect impacts on WSRs from livestock grazing management would be consistent with those described under *Nature and Type of Impacts*.

4.16.5 Cumulative Impacts

The cumulative impacts analysis area for WSRs is the planning area. Under all alternatives, past, present, and reasonably foreseeable future actions with the potential to affect the ORVs, water quantity and quality, and free flowing condition of suitable WSRs in the planning area are climate change and associated impacts from drought and wildfire.

During droughts, water flows are lower, which directly affects water quantity and quality in the suitable WSRs. Wildfires remove vegetation, destabilize soils, and can increase sediment loading in nearby water bodies. Livestock grazing typically reduces the amount of fine fuels, which can minimize the severity of wildfires and potential impacts on WSRs. Alternatives A, D, and E, which would manage the most acres as available for grazing, would result in fewer fine fuels, lower wildfire risk, and fewer potential impacts on WSRs. Alternative C would reduce the influence of grazing's ability to limit fine fuels by managing fewer acres as available for grazing. Alternative B, which would eliminate grazing, would reduce the indirect cumulative impacts of grazing in reducing wildfire potential and subsequent impacts on WSRs.

Post-fire or during low stream flow conditions, cumulative impacts from soil disturbance and nutrient loading associated with livestock grazing would be more severe. Alternative B would eliminate the potential for cumulative impacts on WSRs, while Alternatives A, D, and E would result in the greatest potential for cumulative impacts on WSRs post fire or during drought. Alternative C, would result in slightly fewer cumulative impacts than Alternative A but more than Alternative B.

4.16.6 References

BLM (United States Department of the Interior, Bureau of Land Management). 1997. Utah Rangeland Health{ XE "Rangeland Health" } Standards.

_____. 1999. Grand Staircase-Escalante National Monument, Proposed Management Plan Final Environmental Impact Statement, July 1999.

_____. 2008. Manual 6840—Special Status Species Management. Rel. 6-125, December 12, 2008. BLM, Washington, DC.

_____. 2012. Manual 6400—Wild and Scenic Rivers-Policy and Program Direction for Identification, Evaluation, Planning, and Management. Rel. 6-136, July 13, 2012. BLM, Washington, DC.

4.17 BLM WILDERNESS

This section discusses the impacts from proposed management actions on the Paria Canyon-Vermilion Cliffs Wilderness. Existing conditions are described in **Section 3.15**, BLM Wilderness.

Livestock grazing in the Paria Canyon-Vermilion Cliffs Wilderness cannot increase (BLM 1984) and new improvements to support livestock grazing will not be authorized (43 CFR Section 6304.25(b)). While existing range improvements have local impacts on the untrammeled and natural character, such impacts are localized and do not detract from the unit as a whole. Because grazing would not increase and no new range improvements would be authorized, there would be no impacts on wilderness character under Alternatives A, C, D, or E. Under Alternative B, where livestock grazing would be discontinued and range improvements removed, the untrammeled and natural character of the Wilderness would be enhanced. Such enhancement would be limited to the locations of the range improvements.

4.18 BLM WILDERNESS STUDY AREAS

This section discusses the impacts from proposed management actions on BLM WSAs. Existing conditions are described in **Section 3.16**, BLM Wilderness Study Areas.

4.18.1 Methods of Analysis

In addition to the assumptions in **Section 4.1.1**, the analysis assumes the following:

- No new WSAs will be established as a result of the proposed plan amendment.
- The 17 WSAs (879,600 acres) in the decision area will remain until Congress either designates or releases all or portions of them from further consideration.
- Managing the WSAs according to BLM Manual 6330, Management of Wilderness Study Areas, will protect their wilderness characteristics in a manner that will not "impair the suitability of WSAs for preservation as wilderness" (FLPMA{ XE "Federal Land Policy and Management Act (FLPMA)" } Section 603[c]). This is known as the "nonimpairment standard."

- Management of the WSAs is subject to valid existing rights and grandfathered uses under all alternatives, consistent with BLM Manual 6330, Management of Wilderness Study Areas.
- Maintaining existing facilities and constructing new ones necessary to manage and use permitted AUMs would be conducted in accordance with the nonimpairment standard.
- The physical presence of livestock that are managed in accordance with BLM regulations does not impact naturalness. This is because the WSAs exist in the context of grazing. However, livestock developments and surface disturbance in areas frequented by livestock can impact the natural appearance of the WSAs.
- Actions that would "impair the suitability of WSAs for preservation as wilderness" would not be permitted unless they were to meet one of the following exception criteria, described in BLM Manual 6330, Management of Wilderness Study Areas:
  - *Emergencies*—Any necessary action to prevent loss of life or property, such as search and rescue operations or wildfire suppression activities
  - *Public safety*—Any action necessary to protect the public from human-caused hazards, such as restoring or mitigating safety issues from pre-FLPMA{ XE "Federal Land Policy and Management Act (FLPMA)" } mining operations
  - *Restoration of impacts*—Reclamation activities designed to minimize impacts on wilderness values created by violations and emergencies
  - *Valid existing rights*—Uses and facilities, such as a mineral lease or ROW authorization, existing on the date of approval of FLPMA{ XE "Federal Land Policy and Management Act (FLPMA)" } and considered grandfathered or valid existing rights under BLM Manual 6330; a valid existing right is tied to a particular location and cannot be moved
  - *Grandfathered uses*—Grazing, mining, and mineral leasing uses and facilities allowed on the date of approval of FLPMA{ XE "Federal Land Policy and Management Act (FLPMA)" }; uses can be transferred to a different operator but cannot be relocated within WSAs
  - *Enhance wilderness characteristics or values*—Any action that clearly protects or enhances the land's wilderness values
  - *Other legal requirements*—Any activity taking place in response to another legal authority
- All activities approved in the WSAs would be closely managed to ensure that they would not impair the areas' wilderness characteristics. Preserving wilderness characteristics within the WSAs is the primary consideration when evaluating any proposed action or use.

4.18.2 Factors for Analysis

The factor for analysis of impacts on WSAs is any change in the inventoried wilderness characteristics within the areas. Examples are those that change the naturalness, outstanding opportunities for solitude, primitive recreation, or unique and supplemental values, including cultural resources or status of indigenous species that are listed or are candidates for being listed as threatened or endangered. Changes in wilderness characteristics are affected by the following:

- Changes in acres available for livestock grazing
- Allowance for or restrictions on the construction or maintenance of new structural and nonstructural range improvements{ XE "Range Improvement" }

4.18.3 Nature and Type of Impacts

To manage WSAs to protect their wilderness characteristics the BLM applies the minimum requirements analysis for livestock grazing and all surface-disturbing activities. Because the BLM cannot and would not permit any actions that would impair a WSAs' wilderness characteristics, such impacts would occur only from primitive forms of recreation or activities associated with valid existing rights or grandfathered uses. Section 4(d)(4)(2) of The Wilderness Act states "the grazing of livestock, where established prior to the effective date of this Act, shall be permitted to continue subject to such reasonable regulations as are deemed necessary…." Activities allowed under BLM Manual 6330 that can change the inventoried wilderness characteristics in WSAs are recreational use, vegetation treatments{ XE "Vegetation Treatment" }, frequent livestock use in a given area, and the installation, maintenance, and use of range and wildlife improvements.

Livestock grazing is considered a grandfathered use and, other than minerals, is the only grandfathered use allowed WSAs that may be managed in a manner and to the degree it was when the areas were designated. While the physical presence of a grazing animal does not necessarily impact wilderness areas or WSAs, short- and long-term changes to inventoried wilderness characteristics are possible from fences, stock trails, springs{ XE "Spring" }, and stock ponds associated with livestock grazing. These changes create localized short- and long-term impacts on naturalness and opportunities for unconfined, undeveloped recreation and solitude.

Existing range improvements{ XE "Range Improvement" } are a grandfathered use and can be continually maintained. Regularly maintaining range improvements, such as repairing fencing, could result in short-term impacts on solitude and naturalness. These impacts would be largely confined to the duration of the maintenance activity, but they could be longer, if the maintenance was to result in localized disturbance around the improvements. result in localized disturbance around the improvements.

Surface disturbance and soil erosion in areas frequented by livestock, such as springs{ XE "Spring" } or water developments, can also diminish the naturalness of a WSA. The greatest impacts would be in the vicinity of the disturbance. Changes in grazing could be allowed in number, kind, or season of use following the preparation of an environmental assessment (if not adequately addressed in an existing NEPA{ XE "National Environmental Policy Act (NEPA)" } document). Increases in grazing in a WSA could increase the intensity, duration, and extent of

surface disturbance and associated impacts on naturalness. Such impacts would only be allowed to the extent that they do not impair the WSAs' suitability for designation as wilderness.

There could also be indirect impacts from managing other resources and uses that could enhance or diminish wilderness characteristics in the WSAs. For example, where WSAs overlap or are next to stream segments eligible or suitable for inclusion in the NWSRS or other special management areas, such as SRMAs{ XE "Special Recreation Management Area (SRMA)" }, their management could also indirectly protect wilderness characteristics of the WSAs due to their protective measures. This is because they often include complementary management objectives.

4.18.4 Direct and Indirect Impacts

Impacts Common to Alternatives A, C, D, and E

There are no impacts common to these alternatives.

Alternative A

In the 879,600 acres of WSAs, there would continue to be 824,100 acres (94 percent) available for grazing. Impacts on wilderness characteristics from the presence of livestock would be consistent with those described in the *Nature and Type of Impacts*.

Impacts on wilderness characteristics from structural and nonstructural range improvements{ XE "Range Improvement" } would also be consistent with those described in the *Nature and Type of Impacts*. New range improvements developed consistent with the current MMP{ XE "Monument Management Plan, Grand Staircase-Escalante National Monument (MMP 2000)" } would improve wilderness characteristics by controlling the location and intensity of grazing. However, additional improvements would diminish the sense of solitude and naturalness in the WSAs. This would only be allowed if such facilities meet the nonimpairment standard and to the extent that they do not impact the areas' suitability for designation as wilderness.

Alternative B

By managing all WSAs as unavailable for grazing and removing structural range improvements{ XE "Range Improvement" } associated with livestock grazing, Alternative B would eliminate the potential for livestock grazing to impact wilderness characteristics. Removing the range improvements would improve naturalness and increase opportunities for undeveloped recreation, compared with Alternative A.

Alternative C

There would be less potential for grazing to diminish wilderness characteristics under Alternative C. This is because there would be a 223,100-acre reduction in WSAs available for grazing. In the 278,600 acres of WSAs as unavailable for grazing, there would be no potential for livestock to modify wilderness characteristics. Consistent with the *Nature and Type of Impacts*, there would be the potential for livestock grazing and range improvements{ XE "Range Improvement" } to affect wilderness characteristics in the 601,000 acres of the WSAs available for grazing. This would only be allowed if such facilities meet the nonimpairment standard and to the extent that they do not impact the areas' suitability for designation as wilderness.

Impacts from structural and nonstructural range improvements{ XE "Range Improvement" } would be the same as those under Alternative A and those described in the *Nature and Type of Impacts*.

Alternative D

Impacts would be similar to those under Alternative A, with the exception that there would be 43,000 more acres of WSAs managed as available for grazing, resulting in a slightly greater potential for grazing-related impacts in WSAs. This alternative relies heavily on new structural and nonstructural range improvements to achieve an increase in area-wide AUMs. New nonstructural range improvements would not be permitted in the WSAs. New structural range improvements would only be allowed if they meet the nonimpairment standard. In other words, if they are temporary and do not create new surface disturbance. While an increase in grazing levels could occur, subject to the nonimpairment standard, absent new nonstructural range improvements and most structural range improvements, it is unlikely that there would be an increase in grazing levels in WSAs under Alternative D.

Alternative E

Impacts would be similar to Alternative A, with the exception that there would be 2,200 more acres of WSAs managed as unavailable for grazing. There would be slightly less potential for grazing related impacts on wilderness characteristics in these areas.

4.18.5 Cumulative Impacts

The cumulative impacts analysis area for WSAs is the planning area. Under all alternatives, climate-related drought and wildfire would cumulatively alter the natural landscape conditions that contribute to wilderness characteristics. These conditions would result in a landscape that is more susceptible to degradation from surface disturbances. Within the cumulative impacts analysis area, for Alternatives A, C, D, and E, the cumulative impacts on wilderness characteristics from grazing would be the same as those described in the *Nature and Type of Impacts* and under *Direct and Indirect Impacts*. Alternative B, which would manage the cumulative impacts analysis area as unavailable for grazing, would eliminate the potential for cumulative impacts on wilderness characteristics.

4.19 NPS Proposed Wilderness

This section discusses the impacts from proposed management actions on NPS proposed wilderness areas. Existing conditions are described in **Section 3.17**, NPS Proposed Wilderness.

4.19.1 Methods of Analysis

In addition to the assumptions in **Section 4.1.1**, the analysis assumes the following:

- The NPS will not identify new proposed wilderness areas as a result of the proposed plan amendment.
- The 209,900 acres of NPS-proposed wilderness areas in the planning area will remain until either Congress designates them as wilderness or the NPS rescinds its recommendation.
- Management of the proposed wilderness areas is subject to valid existing rights and grandfathered uses.

- Maintenance of existing facilities and construction of new facilities necessary to manage and use permitted AUMs would be conducted in accordance with NPS policy.
- The physical presence of livestock that are managed in accordance with NPS regulations impacts the natural character in the proposed wilderness areas. Impacts can be mitigated only to prevent significant alteration of resources. Range improvements{ XE "Range Improvement" } and surface disturbance in areas frequented by livestock can, however, impact the natural appearance of the proposed wilderness.

4.19.2 Factors for Analysis

The factor for analysis of impacts on NPS-proposed wilderness areas is any change in the inventoried wilderness character within the areas. Changes in wilderness character are affected by the following:

- Changes in acres available for livestock grazing
- Allowance for or restrictions on the construction or maintenance of new structural and nonstructural range improvements{ XE "Range Improvement" }

4.19.3 Nature and Type of Impacts

Managing proposed wilderness areas to protect their wilderness character would protect wilderness values by applying the minimum requirements analysis for livestock grazing and all surface-disturbing activities. Because the NPS cannot and would not permit any actions that would impair the areas' wilderness character, such impacts would occur only from activities associated with valid existing rights or grandfathered uses. Section 4(d)(4)(2) of The Wilderness Act states "the grazing of livestock, where established prior to the effective date of this Act, shall be permitted to continue subject to such reasonable regulations as are deemed necessary…." Activities allowed that could change the wilderness character in WSAs are recreational use, vegetation treatments{ XE "Vegetation Treatment" }, frequent livestock use in a given area, and the installation, maintenance, and use of range and wildlife improvements.

Livestock grazing is considered a grandfathered use and is the only grandfathered use allowed in the proposed wilderness areas that may be managed in a manner and to the degree it was when the area was identified. While the physical presence of a grazing animal does not necessarily impact proposed wilderness, short- and long-term changes to wilderness character are possible from fences, stock trails, springs{ XE "Spring" }, and stock ponds associated with livestock grazing. These changes create localized short- and long-term impacts on the natural and untrammeled character and opportunities for unconfined, undeveloped recreation and solitude.

Existing range improvements{ XE "Range Improvement" }, are a grandfathered use and can be continually maintained. Regularly maintaining range improvements, such as repairing fencing, could result in short-term impacts on the natural character and on opportunities for solitude. These impacts would be largely confined to the duration of the maintenance activity, but they could be longer, if the maintenance was to result in localized disturbance around the improvements. result in localized disturbance around the improvements.

Surface disturbance and soil erosion in areas frequented by livestock, such as springs{ XE "Spring" } or water developments, can also diminish the natural character of the proposed wilderness. The greatest impacts would be in the vicinity of the disturbance. Changes in grazing could be allowed in number, kind, or season of use following the preparation of an environmental assessment (if not adequately addressed in an existing NEPA{ XE "National Environmental Policy Act (NEPA)" } document). Increases in grazing in the proposed wilderness could increase the intensity, duration, and extent of surface disturbance and associated impacts on the natural character.

4.19.4 Direct and Indirect Impacts

Impacts Common to Alternatives A, C, D, and E

There are no impacts common to these alternatives.

Alternative A

In the 209,900 acres of NPS-proposed wilderness, there would continue to be 121,700 combined acres (58 percent) available for grazing. Impacts on wilderness character from the presence of livestock would be consistent with those described in the *Nature and Type of Impacts*.

Impacts on wilderness character from structural and nonstructural range improvements{ XE "Range Improvement" } would also be consistent with those described in the *Nature and Type of Impacts*. New range improvements developed consistent with the GMP, GzMP, NPS Management Policies, and Director's Oder #41 would improve wilderness character by controlling the location and intensity of grazing. However, additional improvements would diminish the natural qualities and opportunities for solitude in the proposed wilderness areas.

Alternative B

By managing all NPS-proposed wilderness areas as unavailable for grazing and removing structural range improvements{ XE "Range Improvement" } associated with livestock grazing, Alternative B would eliminate the potential for livestock grazing to impact wilderness character. Removing the range improvements would improve natural qualities and increase opportunities for undeveloped recreation, compared with Alternative A.

Alternative C

There would be less potential for grazing to diminish wilderness character under Alternative C. This is because there would be a 24,900-acre reduction in NPS-proposed wilderness areas available for grazing. In the 113,100 acres of NPS-proposed wilderness areas managed as unavailable for grazing, there would be no potential for livestock to modify wilderness character. Consistent with the *Nature and Type of Impacts*, there would be the potential for livestock grazing and range improvements{ XE "Range Improvement" } to affect wilderness character in the 96,800 acres of proposed wilderness available for grazing.

Impacts from structural and nonstructural range improvements{ XE "Range Improvement" } would be the same as those under Alternative A and those described in the *Nature and Type of Impacts*.

Alternative D

Impacts would be similar to those under Alternative A, with the exception that there would be 1,600 fewer acres of proposed wilderness managed as available for grazing, resulting in a slightly reduced potential for grazing-related impacts in proposed wilderness.

Alternative E

Impacts would be similar to Alternative A, with the exception that there would be 6,500 more acres of NPS-proposed wilderness areas managed as unavailable for grazing. There would be slightly less potential for grazing related impacts on wilderness character in these areas.

4.19.5 Cumulative Impacts

The cumulative impacts analysis area NPS-proposed wilderness is the planning area. Under all alternatives, climate-related drought and wildfire would cumulatively alter the untrammeled landscape conditions that contribute to wilderness character. These conditions would result in a landscape that is more susceptible to degradation from surface disturbances. Within the cumulative impacts analysis area, for Alternatives A, C, D, and E, the cumulative impacts on wilderness character from grazing would be the same as those described in the *Nature and Type of Impacts* and under *Direct and Indirect Impacts*. Alternative B, which would manage the cumulative impacts analysis area as unavailable for grazing, would eliminate the potential for cumulative impacts on wilderness character.

4.20 TRIBAL INTERESTS

Tribal consultation is ongoing, regarding grazing and the five alternatives. This section addresses potential impacts from grazing on Native American tribal interests, specifically Indian Trust Assets and treaty-based rights, as well as areas and sites of traditional cultural or religious importance to the tribes. Indian Trust Assets are legal interests in property, physical assets, or intangible property rights held in trust by the US Government for Indian tribes or individual Indians. Existing conditions are described in **Section 3.18**, Tribal Interests.

4.20.1 Methods of Analysis

The BLM has initiated government-to-government tribal consultations with affected federally recognized Indian tribes to identify tribal interest and traditional cultural resources in the planning area. All laws, regulations, and policies pertinent to determining impacts on tribal interests and resources (such as Executive Order 13007, Native American Sacred Sites) were considered and included in impacts criteria. This known information was overlain with the actions found under each alternative in **Chapter 2**, and conclusions were drawn based on tribal consultation and an understanding of how these types of actions may affect tribal interests.

In addition to the assumptions in **Section 4.1.1**, the analysis assumes the following:

- The criteria of adverse effect (as defined in 36 CFR, Subpart 800.5a, as described in **Section 4.11**, Cultural Resources) provide a general framework for identifying and determining the context and intensity of potential impacts on Native American or other traditional community, cultural, or religious practices or resources, if these are present. Assessing the impacts on these resources requires consultation with the affected group, as defined in 36 CFR, Subpart 800.2.

- Native American heritage resources include locations (sites, natural features, resource gathering areas, and places) of traditional cultural or religious importance to Native American tribes. The types of resources may or may not be eligible for listing on the NRHP**{** XE "National Register of Historic Places (NRHP)" **}**. The types of impacts on Native American heritage resources are best determined through tribal consultation. Due to the confidential nature of the information, the resource descriptions and impacts resulting from proposed actions may or may not be available as part of this EIS.
- Native Americans and other traditional communities have concerns about federal actions with potential impacts on cultural resources, religious practices, and gathering natural resources. In such cases, the BLM will consult with the potentially affected Indian tribes.
- There may be areas of importance to contemporary Native Americans that are not readily identifiable outside of those communities.
- Consultation would continue with Indian tribes to identify any TCPs**{** XE "Traditional Cultural Property (TCP)" **}** or resource uses and to address impacts. Through this process, impacts would be minimized or eliminated, although residual impacts would be possible.

4.20.2 Factors for Analysis

Factors for analysis should provide information on determining the extent or degree to which a tribal interest, resource, or setting is damaged or its physical integrity is lost or is otherwise adversely affected by a proposed action. Unlike cultural resources, which have legal criteria for determining the impacts, the impacts on areas or resources of tribal interest and the severity of impacts depends on the perspective and context of the tribe or affected group. In other words, significant impacts would be determined by Indian tribes defining what is culturally or spiritually important to them.

4.20.3 Nature and Type of Impacts

Impacts are difficult to quantify because the locations of most tribal resources are unknown and would be determined through consultation. Such resources are TCPs**{** XE "Traditional Cultural Property (TCP)" **}**, historic properties that tribes may have affiliation to or that they consider sacred, or other resources or practices that may not be eligible as historic properties under the NHPA**{** XE "National Historic Preservation Act (NHPA)" **}**, but would be considered under AIRFA**{** XE "American Indian Religious Freedom Act (AIRFA)" **}**. When referring to historic properties in Chapter 4, these additional resources are included under this category to reflect the obligation of the NPS and BLM to comply with legislation other than the NHPA.

There are no Indian Trust Assets in the planning area. As detailed in **Section 3.9**, Cultural Resources, cultural resource investigations or surveys have been conducted on only 7 percent of GSENM; even so, approximately 5,000 archaeological sites were identified. Further, the number of TCPs**{** XE "Traditional Cultural Property (TCP)" **}** in the decision area is unknown.

Consultation through the Section 106 process is ongoing, and, although nine tribes were contacted, only the Hopi Tribe and Kaibab Paiute Tribe have responded. These Tribes stated

their concerns about grazing-related impacts on all cultural resources, without specifying any individual TCPs{ XE "Traditional Cultural Property (TCP)" }. Through other avenues, the Navajo and Kaibab Paiute have also informally named two potential TCPs. The impacts for tribal resources would be similar to that discussed for historic properties in **Section 4.11**, Cultural Resources.

Other types of impacts specific to tribal resources could also include alterations of a property's setting that make it no longer usable by tribal members or that decrease their access so that they could no longer exercise certain cultural uses and practices.

Potential impacts or adverse effects on tribal resources and historic properties and their settings from subsequent undertakings would be addressed at the project design and implementation phase. Required separate compliance with Section 106 of the NHPA{ XE "National Historic Preservation Act (NHPA)" } would result in the continued identification and evaluation of tribal resources and historic properties, along with the avoidance, minimization, or mitigation of potential adverse impacts or adverse effects. If previously undiscovered tribal resources and historic properties are identified during an undertaking, work would be suspended{ XE "Suspension" } while the resource is evaluated for its eligibility for listing on the NRHP{ XE "National Register of Historic Places (NRHP)" }. If it were deemed eligible by the NPS or BLM (with concurrence from the Utah or Arizona SHPO{ XE "State Historic Preservation Office (SHPO)" }), it could be avoided or mitigated to minimize further impacts. Consultation would continue with Native Americans and other groups to identify any tribal resources and TCPs{ XE "Traditional Cultural Property (TCP)" } and to address impacts.

4.20.4 Direct and Indirect Impacts

Impacts Common to Alternatives A, C, D, and E

Under Alternatives A, C, D, and E, which include continued grazing on the GSENM, there is the potential for direct and indirect adverse impacts on tribal resources. There may also be direct and indirect impacts or adverse effects from future implementation of management actions. An example of these actions is making specific range improvements{ XE "Range Improvement" } near a TCP{ XE "Traditional Cultural Property (TCP)" } or sacred site, although this would require additional environmental review under NEPA{ XE "National Environmental Policy Act (NEPA)" } and the NHPA{ XE "National Historic Preservation Act (NHPA)" }.

As previously stated, approximately 7 percent of the decision area has been comprehensively inventoried (Class III) for tribal resources and historic properties. As such, potential impacts under NEPA{ XE "National Environmental Policy Act (NEPA)" } on the tribal resources and historic properties are considered broadly, with the acknowledgment that there are both documented and unidentified tribal resources in the planning area. Potential grazing and AUMs provide the general proxy for actual case-by-case analyses of possible direct and indirect impacts. These would be from potential land use allocations, management actions, and allowable uses described in this MMP{ XE "Monument Management Plan, Grand Staircase-Escalante National Monument (MMP 2000)" }-A/EIS. Examples are whether an area would be available or unavailable for livestock grazing, whether there would be seasonal restrictions to allow for specific tribal use of resources, and whether a broad array of structural or nonstructural range

improvements{ XE "Range Improvement" } would be allowed, given resource constraints and other management directives.

The NPS and BLM have identified grazing-related impacts on NRHP{ XE "National Register of Historic Places (NRHP)" }-eligible resources in the decision area and have highlighted certain types of resources as especially sensitive, when accessible to livestock. Examples are as follows:

- Rock shelters, where cattle tend to congregate
- Sites with standing prehistoric or historic architecture
- Open sites in sensitive locations, such as those on or near erosive soils or riparian areas{ XE "Riparian Area" } that contain easily damaged resources or archaeological features
- Rock art sites, including areas of prehistoric and historic significance
- Areas of tribal significance or traditional use

The impacts for tribal resources would be similar to those discussed for historic properties in **Section 4.11**, Cultural Resources. Other types of impacts specific to tribal resources could also include alterations of a property's setting. This could make the property no longer usable by tribal members or could decrease access for tribal members so that they could no longer exercise certain cultural uses and practices.

The BLM would continue to manage lands in a manner that accommodates Native American religious traditions, practices, and beliefs. Management is guided by directives contained in the following:

- BLM Manual 8120
- AIRFA{ XE "American Indian Religious Freedom Act (AIRFA)" } (42 USC, Section 1996)
- NAGPRA{ XE "Native American Graves Protection and Repatriation Act (NAGPRA)" } (25 USC, Section 3001)
- Executive Order 13007 (Indian Sacred Sites)
- Executive Order 13084 (Tribal Consultation)
- Secretarial Order 3317, DOI Policy on Consultation with Indian Tribes (December 1, 2011)

Alternatives A, C, D, and E allow for the appropriate tribal governments to consult on a case-by-case basis on BLM undertakings that could affect Native American concerns. The BLM would continue to identify, protect, and preserve tribal assets, treaty rights, sacred and religious sites, or special use areas through site- and project-specific modification or mitigation. The agency would consult with the tribes on a case-by-case or project-by-project basis.

Under Alternatives A, C, D, and E, the NPS and BLM would adopt a formal Cultural Resources Management Protocol (**Appendix C**). It would be included in a programmatic agreement

between GSENM and Glen Canyon. This document would provide the framework and guidance for documenting and minimizing impacts or adverse effects on tribal resources and historic properties from future grazing and range improvements{ XE "Range Improvement" }.

Long-term impacts on tribal resources may be mitigated by coordinating activities with potentially affected tribes and implementing range improvements{ XE "Range Improvement" }, such as those detailed under **Section 4.11**, Cultural Resources.

While maximum permitted AUMs vary across alternatives, the density of average actual use AUMs varies only slightly, between 49 and 52 acres available per AUM. There are 52 acres available per AUM under Alternative E, 51 acres available per AUM under Alternative A, 50 acres available per AUM under Alternative D, and 49 acres available per AUM under Alternative C. The density of active use per AUM would vary between 20 acres (Alternative D) and 27 acres (Alternatives A and E). Alternative C would have a density of 26 acres per AUM under active use.

Current trends and future modeling of climate change indicate that more extreme weather patterns would occur throughout the desert Southwest and the GSENM. This pattern could exacerbate the alteration, deterioration, or complete loss of certain types of tribal resources, at variable rates, depending on location, materials, deposits, and many other resource-specific elements. For example, more intensive weathering and exposure to greater climactic fluctuations may significantly deteriorate a historic hogan, wooden hunting blind, Ancestral Puebloan site with organic features and artifacts, rock-art panels, shrines, and sites that may be located along intermittent or perennial{ XE "Perennial" } watercourse.

Climate change{ XE "Climate Change" } may also lead to extirpation or extinction of culturally significant plants and animals. It could also change the course of sacred springs{ XE "Spring" } and other natural features of importance to Native Americans. Because of this, these types of tribal resources on the GSENM are likely to be impacted, as climate change intensifies.

Alternative A

Under Alternative A, the NPS and BLM would continue the current management direction in the 2000 MMP{ XE "Monument Management Plan, Grand Staircase-Escalante National Monument (MMP 2000)" }, the four 1981 BLM MFPs, as amended, and the 1999 GzMP{ XE "Grazing Management Plan, Glen Canyon (GzMP 1999)" } for Glen Canyon. The agencies would also follow existing policy and guidance, such as regulations (specifically 43 CFR, Part 4100, Grazing Administration), BLM manuals, NPS Management Policies, and the NPS Director's orders. Livestock grazing would continue at the current permitted levels, and areas currently closed would remain unavailable to grazing. Also, both structural and nonstructural range improvements{ XE "Range Improvement" } consistent with the MFPs and MMP would be considered in the decision area; however, certain structural features, such as new line cabins, would not be allowed in Glen Canyon.

In total, 2,089,000 acres would be available for livestock grazing; 153,000 acres would remain unavailable. AUMs would continue at existing permitted levels, with 76,957 active AUMs. The density of livestock grazing would be 27 acres per active AUM and 51 acres per AUM, based on average actual use. Combined with acres available for livestock grazing and structural and

nonstructural range improvements{ XE "Range Improvement" } or adverse effects, as summarized in **Sections 4.11.4** and under *Impacts Common to Alternatives A, C, D, and E*, above; however, these potential impacts may be minimized with the adoption of the Cultural Resources Management Protocol (**Appendix C**).

Alternative B

Under Alternative B, the BLM and NPS would discontinue livestock grazing in GSENM and Glen Canyon, for a total of 2,242,000 acres. In addition, livestock grazing would be discontinued in allotments within the KFO and ASFO, where GSENM has livestock grazing administration responsibility. Permittees would be given 2 years' notification before the permits are cancelled (43 CFR, Subpart 4110.4-2[b]) and would be provided reasonable compensation for the improvements they have constructed (43 CFR, Subpart 4120.3-6[c]).

Vegetation treatments{ XE "Vegetation Treatment" } for the purposes of improving land health, wildlife habitat, or natural communities, reducing weeds, or stabilizing historic properties may still occur, in accordance with decisions in the existing MMP{ XE "Monument Management Plan, Grand Staircase-Escalante National Monument (MMP 2000)" } and Glen Canyon GMP{ XE "General Management Plan, Glen Canyon (GMP 1979)" }. Nonstructural range improvements{ XE "Range Improvement" } would not be maintained for livestock forage. Structural range improvements would be evaluated on a case-by-case basis. This evolution would take into account utility, potential eligibility for listing on the NRHP{ XE "National Register of Historic Places (NRHP)" } of range improvements that might be removed, or other purposes, and removed unless needed to meet objectives for natural resources or protection under the NHPA{ XE "National Historic Preservation Act (NHPA)" }.

Acres available for livestock grazing and AUMs serve as a proxy for potential impacts or adverse effects on tribal resources and historic properties. Because of this, Alternative B would eliminate grazing-related adverse impacts on tribal resources and historic properties throughout the decision area, when compared with Alternative A. However, removing past range improvements{ XE "Range Improvement" } under Alternative B may involve ground-disturbing activities that could impact tribal resources or historic properties, either directly or indirectly.

Alternative C

Alternative C emphasizes management that prioritizes native species diversity and ecological processes. Acres available for livestock grazing would also be reduced to 1,619,700, and there would be an increase in the number of acres unavailable for livestock grazing (622,300 acres, including 150,200 acres of Glen Canyon). This would be a reduction, compared with Alternative A. There would be 63,144 active AUMs, an 18 percent decrease, compared with Alternative A). The density of livestock grazing would be 26 acres per active AUM and 49 acres per AUM, based on average actual use. Also, both structural and nonstructural range improvements{ XE "Range Improvement" }, consistent with the MFPs and MMP{ XE "Monument Management Plan, Grand Staircase-Escalante National Monument (MMP 2000)" }, would be considered in the decision area; however, certain structural features, such as new line cabins, would not be allowed in Glen Canyon.

As acres available for livestock grazing and AUMs serve as a general proxy for potential impacts or adverse effect on tribal resources and historic properties, Alternative C, compared with

Alternative A, would reduce grazing-related impacts or adverse effects on tribal resources and historic properties throughout the decision area. However, under Alternative C, potential structural and nonstructural range improvements{ XE "Range Improvement" } involving ground-disturbing activities may impact tribal resources and historic properties, either directly or indirectly. Potential direct and indirect impacts or adverse effects under Alternative C are summarized in **Sections 4.11.4** and under *Impacts Common to Alternatives A, C, D, and E*, above; however, these potential impacts may be minimized with the adoption of the Cultural Resources Management Protocol (**Appendix C**).

Alternative D

Under Alternative D, 2,135,200 acres would be available for livestock grazing and 106,800 acres would be unavailable, including 90,300 acres in Glen Canyon. There would be 107,955 active AUMs, and projected average actual use would be 42,885 AUMs, a 4 percent increase in average actual use, compared with Alternative A. The density of livestock grazing would be 20 acres per active AUM and 50 acres per AUM, based on average actual use. Also, both structural and nonstructural range improvements{ XE "Range Improvement" } would be considered in the decision area, including new line cabins in Glen Canyon in locations outside of proposed wilderness areas.

Using acres available for livestock grazing and AUMs as a general proxy for potential impacts on tribal resources and historic properties, Alternative D would likely have grazing-related impacts on these properties throughout the decision area; this is similar to Alternative A. However, the number of active AUMs would increase by 40 percent, compared with Alternative A; this would increase the number and density of livestock on the landscape, thereby increasing the probability of impacts on tribal resources. In addition, some sites that are not now grazed would be open to grazing under Alternative D and, potentially, open to new grazing-related impacts not experienced under Alternative A. Potential direct and indirect impacts or adverse effects under Alternative D are summarized in **Sections 4.11.4** and under *Impacts Common to Alternatives A, C, D, and E*, above; however, these potential impacts may be minimized with the adoption of the Cultural Resources Management Protocol (**Appendix C**).

Alternative E

Under Alternative E, 2,065,300 acres would be available for livestock grazing and 176,700 acres would be unavailable, including 95,300 acres in Glen Canyon. There would be 76,520 active AUMs, 437 fewer than under Alternative A (a 1 percent decrease). The projected average actual use would be 1,243 AUMs fewer than under Alternative A (3 percent decrease). The density of livestock grazing would be 27 acres per active AUM and 52 acres per AUM, based on average actual use. Also, both structural and nonstructural range improvements{ XE "Range Improvement" }, consistent with the MFPs and MMP{ XE "Monument Management Plan, Grand Staircase-Escalante National Monument (MMP 2000)" }, would be considered in the decision area; however, certain structural features, such as new line cabins, would not be allowed in Glen Canyon.

Using acres available for livestock grazing and AUMs as a general proxy for potential impacts or adverse effects on tribal resources and historic properties, Alternative E could result in a slight decrease of grazing-related impacts on these properties throughout the decision area, when

compared with Alternative A. Potential direct and indirect impacts or adverse effects under Alternative E are summarized in **Sections 4.11.4** and under *Impacts Common to Alternatives A, C, D, and E*, above; however, these potential impacts may be minimized with the adoption of the Cultural Resources Management Protocol (**Appendix C**).

4.20.5 Cumulative Impacts

The cumulative impacts analysis for tribal resources and historic properties is centered on the broader planning area. These are summarized in **Section 4.2**, Cumulative Effects, in **Table 4-1**.

The BLM's decision to issue grazing leases**{** XE "Lease, Grazing" **}** could have indirect impacts on the environment. This is because issuing grazing leases is a commitment of range and other resources for potential future use. Specific structural and nonstructural range improvements**{** XE "Range Improvement" **}**, would be subject to environmental review under NEPA**{** XE "National Environmental Policy Act (NEPA)" **}** and Section 106 of the NHPA**{** XE "National Historic Preservation Act (NHPA)" **}** (which includes tribal consultation), whether the improvement deemed significant or not. It is reasonable, therefore, to foresee that there could be on-the-ground impacts or adverse effects on tribal resources and historic properties if the BLM and NPS consent to continue grazing in the decision area under this MMP**{** XE "Monument Management Plan, Grand Staircase-Escalante National Monument (MMP 2000)" **}**-A/EIS.

Past and present activities that have had cumulative impacts on tribal resources and historic properties are illegal collecting, vandalism, wildfire, mining, ranching, timber cutting, road building, off-road vehicle riding, and dispersed camping. This includes those activities in sensitive areas, such as rock shelters and other areas known to have higher concentrations of cultural resources. However, certain activities and infrastructure in the decision area installed before NEPA**{** XE "National Environmental Policy Act (NEPA)" **}** and the NHPA**{** XE "National Historic Preservation Act (NHPA)" **}** were in effect, such as ranching and grazing-related corrals, fences, stock tanks, and trails and mining, that may have impacted other tribal resources in the past, may now be considered historic properties themselves. In addition, land exchanges, such as the 1997 acquisition of 180,000 acres of State Trust Lands in GSENM, brought more lands under federal oversight; consequently, this led to greater protection of other tribal resources and historic properties.

Reasonably foreseeable future actions are the proposed Lake Powell pipeline and three hydroelectric power facilities. These would likely have direct, indirect, and cumulative impacts under NEPA**{** XE "National Environmental Policy Act (NEPA)" **}** on tribal resources and historic properties. Specifically, they could have direct impacts by siting infrastructure within the boundaries of NRHP**{** XE "National Register of Historic Places (NRHP)" **}**-eligible resources or in the viewshed of TCPs**{** XE "Traditional Cultural Property (TCP)" **}** or other sensitive sites. Indirect impacts may include fugitive dust, erosion, and increased access, leading to vandalism or illegal collecting. Other reasonably foreseeable actions include potential fire management activities, vegetation management, transmission lines, and recreation-based development. All of these have the potential to impact tribal resources and historic properties.

Incremental cumulative impacts under NEPA**{** XE "National Environmental Policy Act (NEPA)" **}** are not anticipated under Alternative B (other than what is mentioned above), because the decision area would be closed to grazing. Under Alternatives A, C, D, and E, there would likely

be incremental cumulative impacts on tribal resources and historic properties, from the following:

- Artifacts and features trampled by cattle
- Concentration of livestock in sensitive areas containing higher numbers of prehistoric and historic cultural resources
- Chemical changes to archaeological deposits, due to animal waste and urine
- Fugitive dust, erosion, and other possible indirect cumulative impacts

However, under each of these alternatives, impacts or adverse effects may be minimized by adopting the Cultural Resources Management Protocol (**Appendix C**) and through continued tribal consultation. Further, any ground disturbance, such as for structural range improvements**{** XE "Range Improvement" **}**, or other future actions that would occur under Alternatives A, B, C, D, and E, would require further decision-making under NEPA**{** XE "National Environmental Policy Act (NEPA)" **}** and Section 106 of the NHPA**{** XE "National Historic Preservation Act (NHPA)" **}**. These additional actions and analyses would involve a wide variety of factors, as follows:

- The nature of the undertaking
- Policy initiatives about timing of actions,
- Presence of absence of sensitive or significant tribal resources such as TCPs**{** XE "Traditional Cultural Property (TCP)" **}**
- Protection of said resources
- Whether any applications are submitted or any funding is available
- Compliance with other authorities and policies

The use of BMPs and the Cultural Resources Management Protocol (**Appendix C**), along with continued tribal consultation, should minimize impacts or adverse effects on tribal resources and historic properties, as should individual analyses under NEPA**{** XE "National Environmental Policy Act (NEPA)" **}** and Section 106 of the NHPA**{** XE "National Historic Preservation Act (NHPA)" **}** that would determine project-specific direct, indirect, and cumulative impacts.

4.21 SOCIOECONOMICS

This section describes potential impacts on socioeconomics from management actions. Existing conditions are described in **Section 3.19**, Socioeconomics.

4.21.1 Methods of Analysis

The region of analysis includes all of Garfield County and Kane County. Coconino County was not included in the analysis in order to avoid distortions to the dataset. Including Coconino County in the analysis would distort the dataset due to the county's distant population centers, such as Flagstaff. The types of economic impacts analyzed are limited to gross and net revenue to ranchers, differences in 1-year and ten-year revenue, and direct, indirect, and induced impact on output, spending, and employment.

Impacts on Livestock Permittees

The model used in calculating the economic impacts of changes in permitted AUMs applies a partial budgeting, marginal analysis approach to economic analysis of an agricultural enterprise.

The model is based on a series of assumptions related to both market conditions and how the affected ranches might respond to changes in AUMs, given those conditions, as outlined below. The AUMs used as the baseline for the overall comparison in the model were taken from the total available AUMs listed in the descriptions of the alternatives. For the ranch-level impacts analyzed, the number of AUMs included was calculated for each scenario, depending on the head of cow/calf pairs.

The scenarios shown in **Table 4-27**, Ranch Scenarios for Economic Analysis, were used in the analysis. Scenarios 1, 2, 3, 5, and 6 were developed using data provided by participating local ranchers during a series of three public socioeconomic workshops held in communities near GSENM. Scenario 4 was developed using recent market data for the cattle industry (NASS 2016), combined with production data from a southern Utah cow/calf enterprise budget published by Utah State University Agricultural Extension (Utah State University 2016). The scenarios are listed in order based on the number of head of cattle in each.

Table 4-27
Ranch Scenarios for Economic Analysis

Head	15 to 60	60 to 150	150 to 300	650	300 to 1000	1000 +
Season of use	October to April	Year-round	Year-round	October to April	October to May	November to June
Cull rate	10%	10%	10%	20%	10%	10%
Cull or feed	Feed all	Feed some, sell some	Sell all	Feed some, sell some	Sell all	Feed some, sell some
Cost for alternative AUMs	$7.50 to $12 per AUM	$18 to $20 per AUM	$40 to $60 per AUM	$60 per AUM	$80 to $90 per AUM	$18 to $20 per AUM
Herd-moving costs	$80 per head	$80 per head	$60 per head	$52 per head	$60 per head	$60 per head
Herd-maintenance costs	$150 per head	$160 per head	$175 per head	$163 per head	$150 per head	$125 per head
Percent of crop to sale	65% to 70%	80% to 85%	90% to 95%	91%	80%	85%
Calf sale weight	350 to 400	450 to 500	550 to 600	545	500 to 600	75% 450 to 500, 25% 750 to 800
Calf sale price (per pound)	$1.25 to $1.40	$1.40 to $1.60	$1.60 to $1.85	$1.52	$1.50 to $1.60	$1.40 to $1.60
Cull sale weight (pounds)	800	1,000	1,100	1,100	1,250	1,000
Cull sale price (per pound)	$0.60 to $0.70	$0.70 to $0.80	$0.80 to $0.90	$0.72	$0.70 to $0.80	$0.60 to $0.80
Infrastructure value	$10,000 to $20,000	$20,000 to $80,000	$80,000 to $100,000	$83,980	$100,000 to $200,000	$200,000 to $300,000

Scenarios were developed during the public Socioeconomic Workshops

AUMs and months of use for each alternative were inserted into the model to evaluate the economic impacts of the specific percentage increase or decrease in AUMs that would occur with the implementation of each alternative.

In the model, the maximum AUMs permitted in any given month on the allotment is the limiting factor in determining the maximum size of the herd from which annual production can be obtained. The total supported number of animal units is set by the number of AUMs divided by the number of months on the allotment. In other words, an allotment with 180 permitted AUMs spread over 6 months would be able to support no more than 30 animal units. The size of the herd is assumed to be constant throughout the year, regardless of how many months the herd grazes on the allotment being evaluated. Each animal unit is assumed to be equal to one cow/calf pair.

For the analysis of the alternatives, the specific production and market assumptions that were run through the model were developed from data gathered during the socioeconomic workshops and by accessing the latest available industry data at the time the analysis was conducted. Based on the information gathered during these workshops, if the number of permitted AUMs were reduced, the assumption was that the rancher would sell all cattle above the limit set by the number of AUMs. In other scenarios, the assumption was that the rancher would feed all excess cattle in an alternative location, in which case the rancher would feed hay to the excess cattle. Finally, in some scenarios, the assumption was that the rancher would feed some excess animals and sell others. For ease of calculation within this context, the assumption in this analysis was that half of the excess cattle would be fed and half would be sold. The cull cow weight and estimated market price differed by scenario.

Under Alternative D, the total number of animal units would increase slightly, so the assumption is that under each scenario, the rancher would purchase additional cattle to use the increased number of AUMs. The cost of additional cattle is annualized over ten years as a stream of costs added to overall operating costs for the allotment.

Expected annual revenue includes proceeds from calf sales and any revenue stream derived from the sale of excess cattle. Expected annual costs include those for herd maintenance and moving, "off-allotment" feeding, grazing permit**{** XE "Permit, Grazing" **}**, and any stream of costs resulting from the purchase of additional cattle.

The model does not include ranch operations' fixed costs, costs or returns on land investments, or depreciation, which is consistent with the partial budgeting approach to the analysis. The mathematical model provides the ability to include investments in fixed infrastructure on range allotments as part of the overall economic analysis. In order to make the analysis comparable across allotments, however, and without information on future range allotment permitting decisions, infrastructure costs were not included in the completed economic analysis. Total expected annual net revenue in the model equals expected annual revenue minus expected annual costs.

After ranch-level impacts were estimated, output from the model was used as the basis for analyzing the economic impacts of changes in active AUMs under each alternative on the study

area as a whole. Regional economic impacts, in terms of direct, indirect, and induced output, spending, and employment, were evaluated using IMPLAN regional economic analysis software.

Contribution to Socioeconomics from Rangeland Ecosystem Goods and Services

Healthy rangeland ecosystems can provide multiple goods and services that can increase the economic, social, and cultural well-being of individuals and communities. To the degree that rangeland resources are degraded, an opportunity exists, through restoration of ecosystem health, to obtain these goods and services at a higher and more productive level.

According to participants in the Sustainable Rangelands Roundtable, an organization of researchers on the subject of rangeland management, rangeland ecosystem goods and services are divided into three main categories: biological, hydrological/atmospheric, and miscellaneous (Maczko and Hidinger 2008). The roundtable participants identified a list of goods and services available from healthy rangelands. **Table 4-28**, Rangeland Ecosystem Goods and Services, lists some of these goods and services as relevant to the physiography of the GSENM region. There may be even more potential goods and services that could be provided in greater amounts by an increase in rangeland health{ XE "Rangeland Health" } in the area.

Table 4-28
Rangeland Ecosystem Goods and Services

Biological	Hydrological/Atmospheric	Miscellaneous
Forage{ XE "Forage" } for domestic livestock	Drinking water	Views and scenes
Fiber	Water for economic benefit	Cultural and spiritual resources
Habitat for wildlife	Floods for channel and riparian area{ XE "Riparian Area" } rejuvenation	Historical and archaeological sites
Fishing, hunting, and viewing wildlife	Flood mitigation	Scientifically significant sites
Genetic material	Water bodies for recreation/tourism	Recreation and tourism sites
	Minimizes contributions of chemicals and particulates	Ornamental resources
	Contributes to clean, fresh air	Ceremonial resources

Source: Maczko and Hidinger 2008

Some of the potential benefits of increased rangeland health{ XE "Rangeland Health" } would be realized by individuals who live far from the GSENM region. Those who value the existence of GSENM characteristics, regardless of whether they are able to visit the area in person, can be assumed to benefit from knowing that these characteristics are being protected and that they will be in place for their future enjoyment.

Economists regularly quantify the value of ecosystem goods and services in dollar terms (Turner et al. 1993). Techniques used to estimate the dollar value of these benefits are as follows, and each is explained below:

- Revealed preference methods

  - Hedonic pricing
  - Travel cost
- Expressed preference methods
  - Contingent valuation
  - Welfare measures
- Replacement cost method
- Dose-response methods
- Opportunity cost calculation

Revealed preference methods of valuation estimate the proxy market prices, based on the activities and choices made by actual people.

In the hedonic pricing method of assessing value, the analyst identifies the contribution that environmental or ecosystem services make to the price of other goods and services. For example, a piece of land or home with a scenic view will generally command a higher market price than a similar piece of land or home without the same view. Therefore, if a thriving ecosystem or unaltered, natural landscape provides a more beautiful view, the difference in price between that property and the one without the view could be attributed to the ecosystem itself.

To use the travel cost method of analyzing the value of ecosystem goods or services, the analyst surveys the amount of money people either are willing to spend or actually do spend on visits to a particular place. Expenditures on fuel, vehicle depreciation due to usage, airfares, motels and hotels, restaurant food, and entry fees, among others, can be interpreted as the value the traveler places on the experience of visiting that location. Complicating factors include income impacts, differences in the values visitors place on the time they spend traveling to the location, proximity of the location to the visitors' starting points, and declining willingness to spend money on subsequent visits.

Expressed preference methods use hypothetical economic data, based on interviews or surveys to estimate the market value of ecosystem goods and services.

Contingent valuation methods rely on surveys in which people are asked how much they would be willing to pay to obtain an ecosystem good or service, or they are asked to state how much they would have to be compensated in dollars in exchange for giving up an ecosystem good or service.

For example, landowners might be asked how much they would be willing to pay in order to establish a specific wildlife population on a nearby piece of public land. The total amount for all surveyed landowners could be used as a statistical basis to approximate the market value of establishing the proposed wildlife population. Alternatively, the same landowners could be asked how much they would have to be paid to give up an existing wildlife population on nearby land.

Contingent valuation methods are sometimes less than ideal due to strategic "voting" by survey participants. They are also subject to some unsurprising distortions. People are usually more

conservative when they state how much they would be willing to pay to obtain something in contrast with how much they would have to be paid by someone else in order for them to give up something they already possess or that they might possess in the future.

Welfare measures of value refer to methods in which the total consumer welfare associated with an ecosystem good or service is measured by comparing the estimated dollar amounts that all prospective consumers are willing to pay for an ecosystem good or service, compared with the actual cost to society of providing that good or service. To the degree that the actual cost falls below the amount individuals are willing to pay, an economist would say that consumer surplus (surplus economic enjoyment) is generated by the good or service being evaluated.

In the replacement cost method, economists add up the amount it would cost to provide a specific ecosystem good or service by means of a human-built method. For example, vegetation on a healthy landscape provides water filtration benefits. To calculate the monetary value of those filtration benefits, an economist would use engineers' estimates of the cost of building one or more water treatment plants to treat the same volume of water to the level provided by the ecosystem. This method can also be used to estimate the value of ecosystem services that are expected to be obtained through restoring a degraded landscape.

The dose-response method is used to estimate the value of a healthy ecosystem by identifying the cost of treatment for ecological damages, where treatment or mitigation is required locally, downstream, or downwind. For example, a degraded ecosystem could allow elevated levels of nutrients to pollute a water body that is a source of drinking water at some point downstream. In such a scenario, the cost of treating human or livestock illnesses caused by the polluted water could be used to estimate some of the value of repairing the ecosystem so that nutrient runoff is reduced or eliminated.

Similarly, the cost of water treatment downstream to remove the nutrient load (thus preventing contamination-related illnesses) can also be used to approximate the value of upstream ecosystem restoration. This method is sometimes closely correlated with the replacement cost method.

In the opportunity cost method of valuation, the following rule is applied: The value of something is equal to the value of whatever must be given up in order to obtain it. Conversely, based on the rules of mathematical equality, this must mean that the value of what was given up is equal to the value of what was obtained in the exchange. This method is sometimes used to make a statement on the value of an ecosystem when a damaging activity either is proposed or has already occurred. For example, if a new gold mine is opened on a piece of land, then the total value of the ecosystem goods and services that were given up in order for the mine to be opened and operated is said to be equal to the total economic value generated by the mine.

These and other methods all provide a means of quantifying, in dollars, the value of goods and services not directly traded in existing markets. Many of the goods and services provided by healthy rangeland ecosystems are already traded in existing market systems and could be valued by means of identifying the quantities and qualities in which they exist. The estimation of the market value of all the goods and services provided by the rangeland within GSENM falls outside the scope of the present analysis.

In addition to the assumptions in **Table 4-27**, Ranch Scenarios for Economic Analysis, above, the analysis is based on the following assumptions:

- Ranchers will sell mother cows that are in excess of permitted numbers (due to reduced AUMs) as cull cows, and revenues from those sales will earn 1 percent interest.
- In the case of an increase in permitted AUMs, ranchers will purchase additional cows to use the additional AUMs.
- No private pasture is available as a source of replacement forage.
- Federal grazing fee per AUM is $2.11.
- Costs of ownership/capital costs were not included in the analysis.
- Permitted AUMs within an allotment is the limiting factor that sets maximum herd sizes.

Throughout the analysis, numbers are expressed as fractions in the number of head. While this is not realistic, it does allow for a more accurate comparison across alternatives and scenarios. Although these fractions were not rounded to make them more realistic, they do not affect the overall analysis. However, they do slightly affect the outcomes of the various scenarios in degrees that increase as the size of the modeled cattle operation decreases. Infrastructure spending was not included in the analysis.

Implementation-level decisions, such as specific fences, watering facilities, and other infrastructure, as well as decisions on nonstructural range improvements**{** XE "Range Improvement" **}**, are considered during permit renewal or through separate NEPA**{** XE "National Environmental Policy Act (NEPA)" **}** analyses. Therefore, these are outside of the scope of this planning-level document and are not included in the socioeconomic analysis.

Impacts on Socioeconomics Resulting from Changes in Recreation

Indirect changes to the recreation industry in the planning area could occur from changes in livestock grazing management. A reduction in AUMs may increase recreation, due to decreased conflicts between these user groups, thereby increasing revenues for the regional tourism and recreation industries. Alternatively, a reduction in AUMs may result in less attraction for tourists to the decision area and reduced revenues for the regional tourism and recreation industries. Many of the management decisions that would drive these changes would occur at the permit renewal level and are outside of the scope of this analysis. Furthermore, additional and currently unavailable information would be needed to assess whether a change in permitted AUMs has an overall direct or inverse economic correlation to the recreation and tourism industries in the planning area.

4.21.2 Factors for Analysis

The factors for analyzing impacts on socioeconomics are the following:

- AUMs available for grazing

- Output, spending, and employment regional economic multipliers and estimated secondary economic activity generated as a result of economic activity within the ranching sector
- Gross and net revenue, both total and for each representative scenario
- Difference in 1-year and 10-year net revenue for each representative scenario
- Nonmarket benefits and ecosystem services

4.21.3 Nature and Type of Impacts

Changes to the active AUMs in the decision area will induce socioeconomic impacts in the regional economy. These impacts include changes in gross and net revenue on ranchers who hold permits in the decision area, changes in employment and income, in tax revenue for local, state, and federal government entities, and in demand for housing and government services. Generally, increasing the active AUMs results in greater revenue for permittees, while reducing AUMs will reduce revenue for permittees. Similarly, changes in permitted AUMs also result in direct, indirect, and induced impacts throughout the regional economy. Within the economic structures of the communities that support the ranching sector, these impacts would result in changes in employment, spending, and output in the ranching sector. Increasing AUMs generally grows the economic size of this sector, while decreasing AUMs generally shrinks the size of the sector.

The degree to which each impact under the various proposed alternatives would affect individual permittees, their families, and the regional economy would depend on the individual circumstances of these economic units. While some permittees might be able to comfortably absorb reductions in gross and net revenue, for other permittees even small reductions in income could tip operations from solvency to insolvency.

Generally, increased livestock grazing reduces ecosystem goods and services, such as providing clean water, wildlife habitat, and forage for wildlife.[1] Conversely, reducing livestock grazing generally increases the provision of these goods and services. However, in instances where a permittee's livestock operation becomes uneconomical to continue, the permittee may elect to sell the ranch base property. The sale could result in further development of the property, which would result in the loss of ecosystem goods and services associated with open spaces, wildlife habitat, and undeveloped viewscapes. Additionally, livestock grazing management can increase rangeland ecosystem goods and services through such mechanisms as the treatment of invasive plant**{** XE "Invasive Species" **}** species and mitigation work to reduce streambank erosion. Actions such as these are taken at the implementation level through the permit renewal process and are therefore not included in this planning level analysis.

In addition, management actions could alter the attitudes and opinions concerning the use of BLM-managed lands.

[1] See the *Vegetation*, *Soils*, *Water*, *Fish and Wildlife*, and *Special Status Species* sections for a complete discussion of the impacts on these resources from livestock grazing.

4.21.4 Direct and Indirect Economic Impacts

Impacts Common to All Alternatives

There are no impacts that are common to all alternatives in the analysis.

Alternative A

Under Alternative A, there would be no change in the number of permits in the decision area, leaving 136 grazing permits**{** XE "Permit, Grazing" **}** in place. The current level of active AUMs and average actual use would remain unchanged, at 76,957 and 41,343, respectively. The expected initial annual gross revenue under active use is estimated to be $6,658,789, and estimated net revenue is $3,220,388, given present market conditions. For average actual use AUMs only, gross revenue is estimated to be $3,577,249, and net revenue is estimated to be $2,214,704. Under Alternative A, these figures would be affected from year to year, as economic conditions for ranchers fluctuate over time with changing market conditions, changes in climate and weather patterns, and changes in family and business circumstances. See **Table 4-29**, Impacts of Alternatives B through E: Active AUMs with Workshop Assumptions, and **Table 4-31**, Impacts of Alternatives B through E: Average Actual Use AUMs with Workshop Assumptions.

Summary of Alternatives B through E

The economic attributes and impacts for Alternatives B through E are summarized in the tables below for active AUMs and for average actual use AUMs only. The impacts for the alternatives, in comparison with Alternative A, vary by scenario, as described above. Impacts were evaluated for the following four settings:

	All AUMs	Active AUMs
Workshop assumptions	Scenarios 1 through 6	Scenarios 1 through 6
Increased production	Scenarios 1 through 6	Scenarios 1 through 6

"Workshop assumptions" indicates that, when cattle are moved off an allotment and fed in an alternate location, there would be no additional weight gain or calf survival rates beyond that shown in the scenarios developed during the socioeconomic workshops. "Increased production" indicates that calves are raised in a controlled setting, where the cattle are fed hay and are protected from predators, disease, accidents, and other hazards. As a result, overall calf weight gain will be 25 percent higher than on range allotments, and the success rate in taking calves to market is increased to 95 percent for all scenarios.

Alternative B

Under Alternative B, the socioeconomic impacts are the same for both active AUMs and average actual use AUMs; this is because all 136 grazing permits**{** XE "Permit, Grazing" **}** would be cancelled and no AUMs would be permitted after a 2-year notice period, a 100 percent decrease in both the number of permits and the number of permitted AUMs. Depending on the scenario and the permittee's response, impacts on individual permittees range from a loss of as much as $358,761 to an increase of $10,606 in annual net revenue, as compared with Alternative A. See **Table 4-29**, Impacts of Alternatives B through E: Active AUMs with

Workshop Assumptions, **Table 4-30**, Impacts of Alternatives B through E: Active AUMs with Increased Production, **Table 4-31**, Impacts of Alternatives B through E: Average Actual Use AUMs with Workshop Assumptions, and **Table 4-32**, Impacts of Alternatives B through E: Average Actual Use AUMs with Increased Production.

Table 4-29
Impacts of Alternatives B through E: Active AUMs with Workshop Assumptions

Scenario	Response to Change in Available AUMs	Head of Cattle[1]	Alternative A (No Action) Estimated Present Annual Net Revenue	Alternative B (100% reduction in available AUMs) Estimated Annual Net Revenue	Estimated 1-Year Impact on Net Revenue	Estimated 10-Year Impact on Net Revenue
Scenario 1	Feed excess cattle	15 to 60 Head	$168 to $6,486	-$395 to $2,349	-$564 to -$4,136	-$4,808 to -$35,284
Scenario 2	Feed half/sell half	60 to 150 Head	$11,297 to $20,801	$2,145 to $6,494	-$9,151 to -$14,306	-$78,065 to -$122,040
Scenario 3	Sell all	150 to 300 Head	$67,872 to $206,619	$13,937 to $31,358	-$53,935 to -$175,261	-$460,078 to -$1,495,013
Scenario 4	Feed half/sell half	650 Head	$242,691	$41,960	-$200,732	-$1,712,277
Scenario 5	Sell all	300 to 1,000 Head	$93,942 to $464,344	$27,715 to $105,582	-$66,227 to -$358,761	-$564,932 to -$3,060,307
Scenario 6	Feed half/sell half	1,000 Head	$360,489 to $502,015	$161,646 to $235,011	-$198,842 to -$267,004	-$1,696,174 to -$2,277,599

Table 4-29
Impacts of Alternatives B through E: Active AUMs with Workshop Assumptions

Scenario	Response to Change in Available AUMs	Head of Cattle	Alternative A (No Action)	Alternative C (17.9% reduction in available AUMs)		
			Estimated Present Annual Net Revenue	Estimated Annual Net Revenue	Estimated 1-Year Impact on Net Revenue	Estimated 10-Year Impact on Net Revenue
Scenario 1	Feed excess cattle	15 to 60 Head	$3,839 to $21,168	$68 to $5,745	-$101 to -$740	-$861 to -$6,316
Scenario 2	Feed half/sell half	60 to 150 Head	$5,648 to $20,801	$9,658 to $18,240	-$1,638 to -$2,561	-$13,974 to -$21,845
Scenario 3	Sell all	150 to 300 Head	$67,872 to $206,619	$54,771 to $167,920	-$13,101 to -$38,699	-$111,753 to -$330,114
Scenario 4	Feed half/sell half	650 Head	$242,691	$206,760	-$207,641	-$306,498
Scenario 5	Sell all	300 to 1,000 Head	$93,942 to $464,344	$82,088 to $399,126	-$11,855 to -$65,217	-$101,123 to -$556,318
Scenario 6	Feed half/sell half	1,000 Head	$360,489 to $502,015	$324,896 to $454,220	-$35,593 to -$47,794	-$303,616 to -$407,691

Table 4-29
Impacts of Alternatives B through E: Active AUMs with Workshop Assumptions

Scenario	Response to Change in Available AUMs	Head of Cattle	Alternative A (No Action)	Alternative D (40.3% increase in available AUMs)		
			Estimated Present Annual Net Revenue	Estimated Annual Net Revenue	Estimated 1-Year Impact on Net Revenue	Estimated 10-Year Impact on Net Revenue
Scenario 1	Buy Cows	15 to 60 Head	$168 to $6,486	-$104 to $7,512	-$272 to $1,026	-$2,323 to $8,755
Scenario 2	Buy Cows	60 to 150 Head	$11,297 to $20,801	$13,865 to $26,916	$2,568 to $6,115	$21,909 to $52,162
Scenario 3	Buy Cows	150 to 300 Head	$67,872 to $206,619	$92,456 to $286,939	$24,584 to $80,320	$209,705 to $685,145
Scenario 4	Buy Cows	650 Head	$242,691	$316,174	$73,483	$626,827
Scenario 5	Buy Cows	300 to 1,000 Head	$93,942 to $464,344	$119,400 to $604,230	$25,457 to $139,887	$217,156 to $1,193,260
Scenario 6	Buy Cows	1,000 Head	$360,489 to $502,015	$477,419 to $666,531	$116,931 to $164,517	$456,460 to $1,403,460

Table 4-29
Impacts of Alternatives B through E: Active AUMs with Workshop Assumptions

Scenario	Response to Change in Available AUMs	Head of Cattle	Alternative A (No Action)	Alternative E (0.6% reduction in available AUMs)		
			Estimated Present Annual Net Revenue	Estimated Annual Net Revenue	Estimated 1-Year Impact on Net Revenue	Estimated 10-Year Impact on Net Revenue
Scenario 1	Feed excess cattle	15 to 60 Head	$168 to $6,486	$165 to $6,461	-$3 to -$25	-$29 to -$212
Scenario 2	Feed half/sell half	60 to 150 Head	$5,648 to $20,801	$11,242 to $20,715	-$55 to -$86	-$469 to -$733
Scenario 3	Sell all	150 to 300 Head	$67,872 to $206,619	$66,157 to $203,713	-$1,715 to -$2,906	-$14,628 to -$24,792
Scenario 4	Feed half/sell half	650 Head	$242,691	$241,487	-$1,204	-$10,274
Scenario 5	Sell all	300 to 1,000 Head	$93,942 to $464,344	$93,545 to $462,191	-$397 to -$2,153	-$3,390 to -$18,362
Scenario 6	Feed half/sell half	1,000 Head	$360,489 to $502,015	$359,297 to $500,412	-$1,193 to -$1,602	-$10,177 to -$13,665

[1]Workshop assumptions = no increase in weight gain when fed on hay or private pasture

Table 4-30
Impacts of Alternatives B through E: Active AUMs with Increased Production

Scenario	Response to Change in Available AUMs	Head of Cattle[1]	Alternative A (No Action)	Alternative B (100% reduction in available AUMs)		
			Estimated Present Annual Net Revenue	Estimated Annual Net Revenue	Estimated 1-Year Impact on Net Revenue	Estimated 10-Year Impact on Net Revenue
Scenario 1	Feed excess cattle	15 to 60 Head	$168 to $6,486	$2,780 to $17,092	$2,611 to $10,606	$22,273 to $90,471
Scenario 2	Feed half/sell half	60 to 150 Head	$5,648 to $20,801	$4,696 to $13,784	-$6,600 to -$7,016	-$56,300 to -$59,855
Scenario 3	Sell all	150 to 300 Head	$67,872 to $206,619	$13,937 to $31,358	-$53,935 to -$175,261	-$460,078 to -$1,495,013
Scenario 4	Feed half/sell half	650 Head	$242,691	$101,729	-$140,962	-$1,202,432
Scenario 5	Sell all	300 to 1,000 Head	$93,942 to $464,344	$27,715 to $105,582	-$66,227 to -$358,761	-$564,932 to -$3,060,307
Scenario 6	Feed half/sell half	1,000 Head	$360,489 to $502,015	$262,052 to $354,216	-$98,436 to -$147,799	-$839,685 to -$1,260,752

Table 4-30
Impacts of Alternatives B through E: Active AUMs with Increased Production

Scenario	Response to Change in Available AUMs	Head of Cattle	Alternative A (No Action)	Alternative C (17.9% reduction in available AUMs)		
			Estimated Present Annual Net Revenue	Estimated Annual Net Revenue	Estimated 1-Year Impact on Net Revenue	Estimated 10-Year Impact on Net Revenue
Scenario 1	Feed excess cattle	15 to 60 Head	$168 to $6,486	$636 to $8,384	$467 to $1,898	$3,987 to $16,194
Scenario 2	Feed half/sell half	60 to 150 Head	$5,648 to $20,801	$10,838 to $19,544	-$458 to -$1,256	-$3,909 to -$10,714
Scenario 3	Sell all	150 to 300 Head	$67,872 to $206,619	$39,831 to $121,161	-$28,041 to -$85,458	-$239,195 to -$728,973
Scenario 4	Feed half/sell half	650 Head	$242,691	$217,459	-$25,232	-$215,236
Scenario 5	Sell all	300 to 1,000 Head	$93,942 to $464,344	$67,120 to $316,784	-$26,822 to -$147,559	-$228,798 to -$1,258,709
Scenario 6	Feed half/sell half	1,000 Head	$360,489 to $502,015	$342,869 to $475,558	-$17,650 to -$26,456	-$150,305 to -$225,675

Table 4-30
Impacts of Alternatives B through E: Active AUMs with Increased Production

Scenario	Response to Change in Available AUMs	Head of Cattle	Alternative A (No Action)	Alternative D (40.3% increase in available AUMs)		
			Estimated Present Annual Net Revenue	Estimated Annual Net Revenue	Estimated 1-Year Impact on Net Revenue	Estimated 10-Year Impact on Net Revenue
Scenario 1	Buy Cows	15 to 60 Head	$168 to $6,486	-$104 to $7,512	-$272 to $1,026	-$2,323 to $8,755
Scenario 2	Buy Cows	60 to 150 Head	$11,297 to $20,801	$13,865 to $26,916	$2,568 to $6,115	$21,909 to $52,162
Scenario 3	Buy Cows	150 to 300 Head	$67,872 to $206,619	$92,456 to $286,939	$24,584 to $80,320	$209,705 to $685,145
Scenario 4	Buy Cows	650 Head	$242,691	$316,174	$73,483	$626,827
Scenario 5	Buy Cows	300 to 1,000 Head	$93,942 to $464,344	$119,400 to $604,230	$25,457 to $139,887	$217,156 to $1,193,260
Scenario 6	Buy Cows	1,000 Head	$360,489 to $502,015	$477,419 to $666,531	$116,931 to $164,517	$997,442 to $1,403,460

Table 4-30
Impacts of Alternatives B through E: Active AUMs with Increased Production

Scenario	Response to Change in Available AUMs	Head of Cattle	Alternative A (No Action)	Alternative E (0.6% reduction in available AUMs)		
			Estimated Present Annual Net Revenue	Estimated Annual Net Revenue	Estimated 1-Year Impact on Net Revenue	Estimated 10-Year Impact on Net Revenue
Scenario 1	Feed excess cattle	15 to 60 Head	$168 to $6,486	$184 to $6,549	$16 to $64	$134 to $543
Scenario 2	Feed half/sell half	60 to 150 Head	$5,648 to $20,801	$11,282 to $20,758	-$16 to -$42	-$131 to -$360
Scenario 3	Sell all	150 to 300 Head	$67,872 to $206,619	$66,157 to $203,713	-$1,715 to -$2,906	-$14,628 to -$24,792
Scenario 4	Feed half/sell half	650 Head	$242,691	$241,846	-$846	-$7,215
Scenario 5	Sell all	300 to 1,000 Head	$93,942 to $464,344	$93,545 to $462,191	-$397 to -$2,153	-$3,390 to -$18,362
Scenario 6	Feed half/sell half	1,000 Head	$360,489 to $502,015	$359,900 to $501,127	-$592 to -$887	-$5,038 to -$7,564

[1]Increased production = 25% increase in total calf sale weight when fed on hay or private pasture

Table 4-31
Impacts of Alternatives B through E: Average Actual Use AUMs with Workshop Assumptions

Scenario	Response to Change in Available AUMs	Head of Cattle[1]	Alternative A (No Action)	Alternative B (100% reduction in available AUMs)		
			Estimated Present Annual Net Revenue	Estimated Annual Net Revenue	Estimated 1-Year Impact on Net Revenue	Estimated 10-Year Impact on Net Revenue
Scenario 1	Feed excess cattle	15 to 60 Head	$168 to $6,486	-$395 to $2,349	-$564 to -$4,136	-$4,808 to -$35,284
Scenario 2	Feed half/sell half	60 to 150 Head	$5,648 to $20,801	$2,145 to $6,494	-$9,151 to -$14,306	-$78,065 to -$122,040
Scenario 3	Sell all	150 to 300 Head	$67,872 to $206,619	$13,937 to $31,358	-$53,935 to -$175,261	-$460,078 to -$1,495,013
Scenario 4	Feed half/sell half	650 Head	$242,691	$41,960	-$200,732	-$1,712,277
Scenario 5	Sell all	300 to 1,000 Head	$93,942 to $464,344	$27,715 to $105,582	-$66,227 to -$358,761	-$564,932 to -$3,060,307
Scenario 6	Feed half/sell half	1,000 Head	$360,489 to $502,015	$161,646 to $235,011	-$198,842 to -$267,004	-$169,174 to -$2,277,599

Table 4-31
Impacts of Alternatives B through E: Average Actual Use AUMs with Workshop Assumptions

Scenario	Response to Change in Available AUMs	Head of Cattle	Alternative A (No Action)	Alternative C (19.3% reduction in available AUMs)		
			Estimated Present Annual Net Revenue	Estimated Annual Net Revenue	Estimated 1-Year Impact on Net Revenue	Estimated 10-Year Impact on Net Revenue
Scenario 1	Feed excess cattle	15 to 60 Head	$168 to $6,486	-$60 to $5,687	-$109 to -$798	-$928 to -$6,810
Scenario 2	Feed half/sell half	60 to 150 Head	$5,648 to $20,801	$9,530 to $18,039	-$1,766 to -$2,761	-$15,067 to -$23,554
Scenario 3	Sell all	150 to 300 Head	$67,872 to $206,619	$53,850 to $165,023	-$14,022 to -$41,596	-$119,613 to -$354,822
Scenario 4	Feed half/sell half	650 Head	$242,691	$299,172	-$38,742	-$330,470
Scenario 5	Sell all	300 to 1,000 Head	$93,942 to $464,344	$81,161 to $394,025	-$12,782 to -$70,318	-$109,032 to -$599,829
Scenario 6	Feed half/sell half	1,000 Head	$360,489 to $502,015	$322,111 to $447,397	-$38,377 to -$54,618	-$327,361 to -$465,902

Table 4-31
Impacts of Alternatives B through E: Average Actual Use AUMs with Workshop Assumptions

Scenario	Response to Change in Available AUMs	Head of Cattle	Alternative A (No Action)	Alternative D (3.7% increase in available AUMs)		
			Estimated Present Annual Net Revenue	Estimated Annual Net Revenue	Estimated 1-Year Impact on Net Revenue	Estimated 10-Year Impact on Net Revenue
Scenario 1	Buy Cows	15 to 60 Head	$168 to $6,486	$143 to $6,580	-$25 to $94	-$213 to $804
Scenario 2	Buy Cows	60 to 150 Head	$11,297 to $20,801	$11,533 to $21,362	$236 to $561	$924 to $2,200
Scenario 3	Buy Cows	150 to 300 Head	$67,872 to $206,619	$68,930 to $212,481	$1,058 to $5,862	$9,027 to $50,005
Scenario 4	Buy Cows	650 Head	$242,691	$249,438	$6,747	$57,550
Scenario 5	Buy Cows	300 to 1,000 Head	$93,942 to $464,344	$96,280 to $477,187	$2,337 to $12,843	$19,937 to $109,555
Scenario 6	Buy Cows	1,000 Head	$360,489 to $502,015	$371,224 to $517,120	$10,736 to $15,105	$91,576 to $128,844

Table 4-31
Impacts of Alternatives B through E: Average Actual Use AUMs with Workshop Assumptions

Scenario	Response to Change in Available AUMs	Head of Cattle	Alternative A (No Action)	Alternative E (3% reduction in available AUMs)		
			Estimated Present Annual Net Revenue	Estimated Annual Net Revenue	Estimated 1-Year Impact on Net Revenue	Estimated 10-Year Impact on Net Revenue
Scenario 1	Feed excess cattle	15 to 60 Head	$168 to $6,486	$163 to $6,444	-$6 to -$41	-$48 to -$353
Scenario 2	Feed half/sell half	60 to 150 Head	$5,648 to $20,801	$11,205 to $20,658	-$91 to -$143	-$781 to -$1,220
Scenario 3	Sell all	150 to 300 Head	$67,872 to $206,619	$65,894 to $202,885	-$1,978 to -$3,734	-$16,874 to -$31,851
Scenario 4	Feed half/sell half	650 Head	$242,691	$240,684	-$2,008	-$17,123
Scenario 5	Sell all	300 to 1,000 Head	$93,942 to $464,344	$93,280 to $460,756	-$662 to -$3,588	-$5,649 to -$30,603
Scenario 6	Feed half/sell half	1,000 Head	$360,489 to $502,015	$358,499 to $475,784	-$1,989 to -$26,231	-$16,962 to -$223,750

[1]Workshop assumptions = no increase in weight gain when fed on hay or private pasture

Table 4-32
Impacts of Alternatives B through E: Average Actual Use AUMs with Increased Production

Scenario	Response to Change in Available AUMs	Head of Cattle[1]	Alternative A (No Action)	*Alternative B (100% reduction in available AUMs)*		
			Estimated Present Annual Net Revenue	Estimated Annual Net Revenue	Estimated 1-Year Impact on Net Revenue	Estimated 10-Year Impact on Net Revenue
Scenario 1	Feed excess cattle	15 to 60 Head	$168 to $6,486	$2,780 to $17,092	$2,611 to $10,606	$22,273 to $90,471
Scenario 2	Feed half/sell half	60 to 150 Head	$5,648 to $20,801	$4,696 to $13,784	-$6,600 to -$7,016	-$56,300 to -$59,855
Scenario 3	Sell all	150 to 300 Head	$67,872 to $206,619	$13,937 to $31,358	-$53,935 to -$175,261	-$460,078 to -$1,495,013
Scenario 4	Feed half/sell half	650 Head	$242,691	$101,729	-$140,962	-$1,202,432
Scenario 5	Sell all	300 to 1,000 Head	$93,942 to $464,344	$27,715 to $105,582	-$66,227 to -$358,761	-$564,932 to -$3,060,307
Scenario 6	Feed half/sell half	1,000 Head	$360,489 to $502,015	$262,052 to $354,216	-$98,436 to -$147,799	-$839,685 to -$1,260,752

Table 4-32
Impacts of Alternatives B through E: Average Actual Use AUMs with Increased Production

Scenario	Response to Change in Available AUMs	Head of Cattle	Alternative A (No Action)	Alternative C (19.3% reduction in available AUMs)		
			Estimated Present Annual Net Revenue	Estimated Annual Net Revenue	Estimated 1-Year Impact on Net Revenue	Estimated 10-Year Impact on Net Revenue
Scenario 1	Feed excess cattle	15 to 60 Head	$168 to $6,486	$672 to $8,533	$504 to $2,047	$4,299 to $17,461
Scenario 2	Feed half/sell half	60 to 150 Head	$5,648 to $20,801	$10,802 to $19,466	-$494 to -$1,354	-$4,215 to -$11,552
Scenario 3	Sell all	150 to 300 Head	$67,872 to $206,619	$53,850 to $165,023	-$14,022 to -$41,596	-$119,613 to -$354,822
Scenario 4	Feed half/sell half	650 Head	$242,691	$215,486	-$27,206	-$232,070
Scenario 5	Sell all	300 to 1,000 Head	$93,942 to $464,344	$81,161 to $394,025	-$12,782 to -$70,318	-$109,032 to -$599,829
Scenario 6	Feed half/sell half	1,000 Head	$360,489 to $502,015	$341,490 to $473,490	-$18,998 to -$28,525	-$162,059 to -$243,325

Table 4-32
Impacts of Alternatives B through E: Average Actual Use AUMs with Increased Production

Scenario	Response to Change in Available AUMs	Head of Cattle	Alternative A (No Action)	Alternative D (3.7% increase in available AUMs)		
			Estimated Present Annual Net Revenue	Estimated Annual Net Revenue	Estimated 1-Year Impact on Net Revenue	Estimated 10-Year Impact on Net Revenue
Scenario 1	Buy Cows	15 to 60 Head	$168 to $6,486	$143 to $6,580	-$25 to $94	-$213 to $804
Scenario 2	Buy Cows	60 to 150 Head	$11,297 to $20,801	$11,533 to $21,362	$236 to $561	$924 to $2,200
Scenario 3	Buy Cows	150 to 300 Head	$67,872 to $206,619	$68,930 to $212,481	$1,058 to $5,862	$9,027 to $50,005
Scenario 4	Buy Cows	650 Head	$242,691	$249,438	$6,747	$57,550
Scenario 5	Buy Cows	300 to 1,000 Head	$93,942 to $464,344	$96,280 to $477,187	$2,337 to $12,843	$19,937 to $109,555
Scenario 6	Buy Cows	1,000 Head	$360,489 to $502,015	$371,224 to $517,120	$10,736 to $15,105	$91,576 to $128,844

Table 4-32
Impacts of Alternatives B through E: Average Actual Use AUMs with Increased Production

Scenario	Response to Change in Available AUMs	Head of Cattle	Alternative A (No Action)	Alternative E (3% reduction in available AUMs)		
			Estimated Present Annual Net Revenue	Estimated Annual Net Revenue	Estimated 1-Year Impact on Net Revenue	Estimated 10-Year Impact on Net Revenue
Scenario 1	Feed excess cattle	15 to 60 Head	$168 to $6,486	$195 to $6,592	$26 to $106	$223 to $95
Scenario 2	Feed half/sell half	60 to 150 Head	$5,648 to $20,801	$11,271 to $20,731	-$25 to -$71	-$219 to -$599
Scenario 3	Sell all	150 to 300 Head	$67,872 to $206,619	$65,894 to $202,885	-$1,978 to -$3,734	-$16,874 to -$31,851
Scenario 4	Feed half/sell half	650 Head	$242,691	$241,282	-$1,410	-$12,025
Scenario 5	Sell all	300 to 1,000 Head	$93,942 to $464,344	$93,280 to $460,756	-$662 to -$3,588	-$5,649 to -$30,603
Scenario 6	Feed half/sell half	1,000 Head	$360,489 to $502,015	$359,504 to $500,537	-$984 to -$1,478	-$8,398 to -$12,607

[1]Adjusted production = 25% increase in total calf sale weight when fed on hay or private pasture

Alternative C

Under Alternative C, the total number of permits would be reduced by 38 percent, a total of 52 permits, leaving 84 grazing permits{ XE "Permit, Grazing" } in place. The reduction in permitted AUMs would result in the impacts described for Alternative C under *Nature and Type of Impacts* for reductions in permitted AUMs. For active AUMs, impacts on individual ranches range from a loss of $207,641 to an increase of $1,898 in annual net revenue, as compared with Alternative A. For average actual use AUMs, impacts range from a loss of $70,318 to an increase of $2,047 in annual net revenue, as compared with Alternative A. See **Table 4-29**, Impacts of Alternatives B through E: Active AUMs with Workshop Assumptions, **Table 4-30**, Impacts of Alternatives B through E: Active AUMs with Increased Production, **Table 4-31**, Impacts of Alternatives B through E: Average Actual Use AUMs with Workshop Assumptions, and **Table 4-32**, Impacts of Alternatives B through E: Average Actual Use AUMs with Increased Production.

Alternative D

Under Alternative D, the total number of permits would remain unchanged at 136, and an increase in the permitted AUMs would result in permittees increasing herd sizes, with corresponding impacts, as described under *Nature and Type of Impacts*. Increased herd size would mostly lead to increased annual net revenues. Under one scenario, increased costs would actually result in a loss of $272 per year due to increased herd size. Increases in annual revenues could be as high as $165,517, as compared with Alternative A. See **Table 4-29**, Impacts of Alternatives B through E: Active AUMs with Workshop Assumptions, **Table 4-30**, Impacts of Alternatives B through E: Active AUMs with Increased Production, **Table 4-31**, Impacts of Alternatives B through E: Average Actual Use AUMs with Workshop Assumptions, and **Table 4-32**, Impacts of Alternatives B through E: Average Actual Use AUMs with Increased Production.

Alternative E

Under Alternative E, one permit would be cancelled, and a reduction in the permitted AUMs would result in impacts associated with decreased AUMs, as described in *Nature and Type of Impacts*. For active AUMs, impacts on individual permittees range from a loss of $2,906 to an increase of $64 in annual net revenue, as compared with Alternative A. For average actual use AUMs, impacts range from a loss of $26,231 to an increase of $106 in annual net revenue, as compared with Alternative A. See **Table 4-29**, Impacts of Alternatives B through E: Active AUMs with Workshop Assumptions, **Table 4-30**, Impacts of Alternatives B through E: Active AUMs with Increased Production, **Table 4-31**, Impacts of Alternatives B through E: Average Actual Use AUMs with Workshop Assumptions, and **Table 4-32**, Impacts of Alternatives B through E: Average Actual Use AUMs with Increased Production.

Summary of Impacts on Rangeland Ecosystem Goods and Services

As described under *Nature and Type of Impacts*, Alternative B and to a lesser extent Alternatives C or E could result in increased goods and services, as compared with Alternative A. Alternative B could result in the loss of some goods and services currently provided by ranchers.

4.21.5 Direct and Indirect Social Impacts

Changes in permitted AUMs have the potential to impact the local economy and, in turn, to impact local social conditions in the following two ways:

- A reduction in a permittee's net revenues would result in lower spending in the community. The economic impact of the reduction in revenue coming into the area via the livestock industry would impact the regional economy, as described above, leading to changes in spending patterns and potentially increasing stress and pressure on the financial security of affected households.
- Changes to net ranch revenues would have an impact on the social aspects of normal ranch activities, such as routine stops at supply stores, cafes, and other gathering places, and on off-ranch participation of permit holders in community activities and events.

Together, these changes could result in an indirect impact on non-ranching residents of the area by impacting the general social setting of the region. Livestock grazing holds a central place in the contemporary culture in the communities surrounding GSENM. During public meetings, local ranchers and other community members expressed a desire that the cultural aspect of ranching and the "cowboy culture" be recognized and perpetuated as an important aspect of life in south-central Utah.

Research has highlighted the fact that ranching is more for ranchers than a simple production activity for generating income (Rimbey et al. 2007). Rather, ranchers value the lifestyle of ranching as well as the specific activities required of them in the course of conducting business. A loss of revenue, such that a ranch would lose its viability as an economic unit, would be expected to have social impacts that could not be offset or compensated for by earning income from alternate sources. The lifestyle impact, sense of self, and other intangible values would have a psychological cost to these individuals; this could change the social network of the region in undesirable ways for some members of the community.

A 2015 study completed for Kane County states the following (Miller and Heaton 2015):

> Permit holders are dependent upon their GSENM permits. One hundred percent of permit holders said there is no cost effective way to replace their GSENM AUMS. Seventy-nine percent (79.31) said they could not reduce the size of their operation to their private property and survive. Seventy-two percent (72.24) stated they would be out of ranching. The difference between the two numbers is that some indicated that they would move to another location to continue ranching. Nearly 62 percent (61.90) said they would need to sell the private holdings to developers. Sixty-two and a half percent (62.5) said they would need to find off-ranch work if they were not already working off-ranch. Most of the others said they would retire in place of finding off-ranch work.

Permittees participating in the socioeconomic workshops expressed similar opinions.

The Kane County study highlighted the long-term family tenure of some ranches in the region. Although younger family members may be classified as new or beginning ranchers when they take over ranching activities, in some cases they represent the fifth generation within the same family that has ranched on the same property. Tenure on allotments in GSENM has not been as long as that noted in the study due to changes in customary allocation and federal grazing allotments since the late 1800s.

While permittees and those in their community expressed concern about the impacts of reduced AUMs, some recreationists and representatives of other interest groups expressed a desire to see lower cattle usage where conflicts between recreational users and grazing cattle have been identified. While social impacts between varying user groups resulting from changes in grazing management is beyond the scope of this analysis, they are important to note, because they impact the social setting and relations in the planning area.

4.21.6 Cumulative Impacts

Cumulative economic impacts are regional impacts on jobs, labor income, and economic output, as summarized in the tables below.

Potential regional impacts under the alternatives vary between two end points: Under Alternative B, losses in output to the regional economy when evaluated for active AUMs could range from losses of nearly $9.4 million per year, up to an increase of more than $2.8 million per year, should cattle production increase off range. For average actual use AUMs, Alternative B could result in regional economic losses in output of just over $5 million or in an increase of nearly $1.54 under the same increased production assumption mentioned above. Under Alternative C, when evaluated for active AUMs, expected regional economic impacts could range from a loss of around $1.7 million to an increase of approximately $0.5 million. When evaluated for average actual use AUMs, Alternative C could result in regional economic impacts, ranging from no impact at all to a loss of approximately $0.84 million. Alternative D would result in economic gains, ranging from $220,426 for average actual use AUMs to $623,390 for active AUMs. There is a wide range of other possible impacts, corresponding to the multiple possible scenarios and outcomes shown in **Table 4-33**, Regional Economic Impacts for Active AUMs, and **Table 4-34**, Regional Economic Impacts for Average Actual Use AUMs. An increase in regional economic activity does not necessarily correlate with increased net income to producers; this is because increased production costs generate regional economic benefits but can cause net losses to ranchers.

The degree to which changes in grazing management in the decision area will impact individual permittees, families, communities, and the overall regional economy depends on many additional and unpredictable factors; examples are regional, national, and global economic conditions, the state of the cattle industry in general and the cow/calf industry in particular, international monetary exchange rates, and other financial market conditions. Other management decisions by federal, state, and local governments and agencies, as well as private investment decisions and related factors, play a role in determining the degree to which impacts from grazing management in the decision area will affect the human environment.

4.21.7 References

Maczko, K., and L. Hidinger (editors). 2008. SRR Monograph No. 3: Sustainable Rangelands Ecosystem Goods and Services. Sustainable Rangelands Roundtable, Fort Collins, Colorado.

Miller, G., and K. Heaton. 2015. Economic and Cultural Report on Livestock Grazing in The Grand Staircase Escalante National Monument to The Kane County Board of Commissioners. Kane County, Kanab, Utah.

NASS (United States Department of Agriculture, National Agricultural Statistics Service). 2012. Census of Agriculture. Internet website: https://www.agcensus.usda.gov/Publications/2012/.

Rimbey, N. R., L. A. Torell, and J. A. Tanaka. 2007. "Why grazing permits{ XE "Permit, Grazing" } have economic value." In *Journal of Agricultural and Resource Economics* 32(1):20-40. Western Agricultural Economics Association.

Turner, K., D. Pearce, and I. Bateman. 1993. *Environmental Economics: An Elementary Introduction*. Johns Hopkins University Press, Baltimore, Maryland.

Utah State University. 2016. Agricultural Extension, Enterprise Budgets. Internet website: http://extension.usu.edu/agribusiness/htm/budgets.

Table 4-33
Regional Economic Impacts for Active AUMs

Regional Economic Impacts for Active AUMs	1-year Total Gross Revenue	Regional Jobs Supported	Regional Jobs Impacts	Regional Labor Income	Regional Labor Income Impacts	Regional Economic Output	Regional Economic Output Impacts
Alternative A: No Action (Baseline)	$6,658,789	57.27	0.00	$671,526	$0	$9,395,711	$0
Alternative B: No Grazing (workshop assumptions)							
Feed all excess cattle	$6,658,789	57.27	0.00	$671,526	$0	$9,395,711	$0
Sell all excess cattle*	$923,292	0.00	-57.27	$0	-$671,526	$0	-$9,395,711
Sell half and feed half of excess cattle	$3,791,041	32.60	-24.66	$382,319	-$289,207	$5,349,250	-$4,046,461
Alternative B: No Grazing (increased production)							
Feed all excess cattle	$8,689,354	74.73	17.46	$876,304	$204,778	$12,260,887	$2,865,176
Sell all excess cattle*	$923,292	0.00	-57.27	$0	-$671,526	$0	-$9,395,711
Sell half and feed half of excess cattle	$4,806,323	41.33	-15.93	$484,708	-$186,817	$6,781,837	-$2,613,874
Alternative C: 17.9% decrease in AUMs (workshop assumptions)							
Feed all excess cattle	$6,658,789	57.27	0.00	$671,526	$0	$9,395,711	$0
Sell all excess cattle	$5,629,326	48.41	-8.85	$567,706	-$103,819	$7,943,114	-$1,452,597
Sell half and feed half of excess cattle	$6,144,058	52.84	-4.43	$619,616	-$51,910	$8,669,413	-$726,298
Alternative C: 17.9% decrease in AUMs (increased production)							
Feed all excess cattle	$7,023,255	60.40	3.13	$708,281	$36,756	$9,909,981	$514,270
Sell all excess cattle	$5,463,604	46.99	-10.28	$550,994	-$120,532	$7,709,276	-$1,686,435
Sell half and feed half of excess cattle	$6,326,290	54.41	-2.86	$637,994	-$33,532	$8,926,547	-$469,164
Alternative D: 40.3% increase in AUMs							
All AUMs	$9,340,925	80.33	23.07	$942,014	$270,488	$13,180,269	$3,784,558

Table 4-33
Regional Economic Impacts for Active AUMs

Regional Economic Impacts for Active AUMs	1-year Total Gross Revenue	Regional Jobs Supported	Regional Jobs Impacts	Regional Labor Income	Regional Labor Income Impacts	Regional Economic Output	Regional Economic Output Impacts
Alternative E: 0.6% decrease in AUMs (workshop assumptions)							
Feed all excess cattle	$6,658,789	57.27	0.00	$671,526	$0	$9,395,711	$0
Sell all excess cattle	$6,626,220	56.99	-0.28	$668,241	-$3,285	$9,349,755	-$45,956
Sell half and feed half of excess cattle	$6,642,469	57.13	-0.14	$669,880	-$1,646	$9,372,683	-$23,028
Alternative E: 0.6% decrease in AUMs (increased production)							
Feed all excess cattle	$6,670,320	57.36	0.10	$672,688	$1,163	$9,411,982	$16,271
Sell all excess cattle	$6,626,220	56.99	-0.28	$668,241	-$3,285	$9,349,755	-$45,956
Sell half and feed half of excess cattle	$6,648,270	57.18	-0.09	$670,465	-$1,061	$9,380,869	-$14,843

*Under this option under Alternative B, although ranchers would realize a stream of revenue from the sale of excess cows in year one, there would be no ongoing economic benefits from the cattle industry to the regional economy because there would be no jobs supported, no wages paid to employees, and no purchases of supplies associated with the allotments in the study area once the cattle had been sold.

Table 4-34
Regional Economic Impacts for Average Actual Use AUMs

Regional Economic Impacts for Average Actual Use AUMs	1-year Total Gross Revenue	Regional Jobs Supported	Regional Jobs Impacts	Regiona l Labor Income	Regional Labor Income Impacts	Regional Economic Output	Regional Economic Output Impacts
Alternative A: No Action (Baseline)	$3,577,249	30.76	0.00	$360,758	$0	$5,047,584	$0
Alternative B: No Grazing (workshop assumptions)							
Feed all excess cattle	$3,577,249	30.76	0.00	$360,758	$0	$5,047,584	$0
Sell all excess cattle*	$496,013	0.00	-30.76	$0	-$360,758	$0	-$5,047,584
Sell half and feed half of excess cattle	$2,036,630	17.52	-13.25	$205,390	-$155,368	$2,873,734	-$2,173,850
Alternative B: No Grazing (increased production)							
Feed all excess cattle	$4,668,113	40.15	9.38	$470,770	$110,011	$6,586,819	$1,539,235
Sell all excess cattle*	$496,013	0.00	-30.76	$0	-$360,758	$0	-$5,047,584
Sell half and feed half of excess cattle	$2,582,062	22.21	-8.56	$260,396	-$100,363	$3,643,351	-$1,404,233
Alternative C: 19.3% decrease in AUMs (workshop assumptions)							
Feed all excess cattle	$3,577,249	30.76	0.00	$360,758	$0	$5,047,584	$0
Sell all excess cattle	$2,982,883	25.65	-5.11	$300,818	-$59,941	$4,208,920	-$838,665
Sell half and feed half of excess cattle	$3,279,909	28.21	-2.56	$330,772	-$29,986	$4,628,030	-$419,554
Alternative C: 19.3% decrease in AUMs (adjusted production)							
Feed all excess cattle	$3,577,249	30.76	0.00	$360,758	$0	$5,047,584	$0
Sell all excess cattle	$2,982,883	25.65	-5.11	$300,818	-$59,941	$4,208,920	-$838,665
Sell half and feed half of excess cattle	$3,280,066	28.21	-2.56	$330,788	-$29,970	$4,628,252	-$419,332
Alternative D: 3.7% increase in AUMs							
All AUMs	$3,710,672	31.91	1.15	$374,214	$13,455	$5,235,847	$188,263

Table 4-34
Regional Economic Impacts for Average Actual Use AUMs

Regional Economic Impacts for Average Actual Use AUMs	1-year Total Gross Revenue	Regional Jobs Supported	Regional Jobs Impacts	Regiona l Labor Income	Regional Labor Income Impacts	Regional Economic Output	Regional Economic Output Impacts
Alternative E: 3% decrease in AUMs (workshop assumptions)							
Feed all excess cattle	$3,577,249	30.76	0.00	$360,758	$0	$5,047,584	$0
Sell all excess cattle	$3,484,624	29.97	-0.80	$351,417	-$9,341	$4,916,888	-$130,696
Sell half and feed half of excess cattle	$3,530,929	30.37	-0.40	$356,087	-$4,671	$4,982,226	-$65,359
Alternative E: 3% decrease in AUMs (adjusted production)							
Feed all excess cattle	$3,610,046	31.05	0.28	$364,066	$3,308	$5,093,862	$46,277
Sell all excess cattle	$3,484,610	29.97	-0.80	$351,416	-$9,342	$4,916,868	-$130,716
Sell half and feed half of excess cattle	$3,547,328	30.51	-0.26	$357,741	-$3,017	$5,005,365	-$42,219

*Under this option under Alternative B, although ranchers would realize a stream of revenue from the sale of excess cows in year one, there would be no ongoing economic benefits from the cattle industry to the regional economy because there would be no jobs supported, no wages paid to employees, and no purchases of supplies associated with the allotments in the study area once the cattle had been sold.

4.22 Environmental Justice

This section discusses impacts on environmental justice from proposed management actions. Existing conditions are described in **Section 3.20**, Environmental Justice.

4.22.1 Methods of Analysis

Guidance for the environmental justice analysis is included in Appendix D of the BLM Land Use Planning Handbook (H-1601-1), Executive Order for Environmental Justice (Executive Order 12898, 59 *Federal Register* 7629), and CEQ**{** XE "Council on Environmental Quality (CEQ)" **}**, 1997 Environmental Justice guidance.

Under Executive Order 128998, each federal agency must identify and address "disproportionately high and adverse human health or environmental impacts of its programs, policies, and activities on minority populations and low-income populations." In addition, according to federal guidance for considering environmental justice in the NEPA**{** XE "National Environmental Policy Act (NEPA)" **}** process (CEQ**{** XE "Council on Environmental Quality (CEQ)" **}** 1997), Indian tribes in the affected area of the proposed action must be considered in the environmental justice analysis.

Environmental justice impacts are determined in a multistep approach. The first step is to identify populations that meet the criteria defined by CEQ**{** XE "Council on Environmental Quality (CEQ)" **}** guidance as low income, minority, or tribal populations that could be impacted by project activities. In the second stop, proposed activities are examined to determine if they would result in adverse impacts. Examples of adverse impacts relevant to the current planning process include the following (EPA 2004):

- Destruction or disruption of community cohesion or a community's economic vitality
- Adverse employment impacts
- Displacement of persons, businesses, farms, or nonprofit organizations

Finally, impacts are examined to determine if they would occur at a disproportionately high level for identified minority, low-income, or tribal populations. Disproportionately high means an impact that is predominantly borne by any segment of the population, such as a minority or a low-income population. It also could refer to an impact on a minority or low-income population that is appreciably more severe or greater in magnitude than the adverse impact on a population that is not a minority or of low income.

4.22.2 Factors for Analysis

Populations with the potential to be impacted by proposed management are identified by the following:

- Percentage of people/families below poverty
- Percentage of people identifying as ethnic or racial minorities
- Percentage of Native American ethnicity and presence of tribal populations

Impacts are examined to determine if they would result in disproportionately high and adverse human health or environmental impacts on the identified minority and low-income populations.

4.22.3 Nature and Type of Impacts

Based on examination of US Census Bureau income, ethnicity, and racial data, Coconino County and census tracts in the county qualify as low income or minority populations (see **Section 3.20**, Environmental Justice). In addition, Coconino County contains Native American populations above that in reference populations.

The potential for proposed actions in the MMP**{** XE "Monument Management Plan, Grand Staircase-Escalante National Monument (MMP 2000)" **}**-A to have disproportionately high and adverse human health or environmental impacts on these populations is low. An environmental justice impact on the identified population only if it is harmful and "appreciably exceeds or is likely to appreciably exceed" the impact on the general population or other comparison group.

The reasoning for a finding of low potential for environmental justice impacts is as follows:

- Impacts from proposed management activities would be spread through the planning area, rather than being concentrated in Coconino County, where low-income, minority, and tribal populations have been identified.
- It is unlikely that, at the planning level of this MMP**{** XE "Monument Management Plan, Grand Staircase-Escalante National Monument (MMP 2000)" **}**-A/EIS, those in the ranching industry who have environmental justice population status (e.g., low-income, minority, or American Indian status) would be disproportionately subjected to economic impacts than those who are not members of environmental justice populations.

Note that the environmental justice populations identified in this analysis are considered comprehensive and the best available data was used; nevertheless, there may be additional minority, low-income, or Native American populations in the planning area that are hidden by the geographic scope of the available census data. Western census tracts generally cover a large geographic area that may not easily disclose small pockets of minority, low-income, or Native American populations that could be in the planning area. A project-level analysis would further assess the potential for environmental justice impacts for specific actions proposed under the final plan.

A planning- or implementation-level EIS is particularly important for assessing potential impacts on members of the ranching community who are also low income, minority, or Native American. The degree to which this population overlaps those considered low income or minority cannot be determined at the planning level scale.

Impacts on environmental justice populations may occur when communities are not involved in planning. In order to reach a wide range of socioeconomic groups, races, and ethnicities, public outreach materials were available in multiple formats. These included the project website, printed and e-mailed newsletters, and public meetings held throughout the planning area. A full record of project consultation and coordination activities is in **Chapter 5**.

A project level analysis would further assess the potential for environmental justice impacts for specific actions proposed under the final plan.

4.22.4 Direct and Indirect Impacts

Impacts Common to Alternatives A, C, D, and E

There are no impacts common to Alternatives A, C, D, and E.

Alternative A

A continuation of the current management direction for livestock grazing under Alternative A is unlikely to have disproportionately adverse impacts on environmental justice populations. Current management actions prescribed at the planning level do not disproportionately target environmental justice populations, when compared with the population as a whole. An analysis at the implementation level must be conducted to determine if current implementation level impacts occur on specific environmental justice populations.

Alternative B

Under Alternative B, livestock grazing would be discontinued in the decision area, following a 2-year lease notification. As discussed in **Section 4.21**, Socioeconomics, this action would result in economic impacts directly for individuals in the ranching industry. It also would result in community-level economic impacts through the loss of ranching operation revenues, tax revenues, and royalties paid at the county, state, and federal level.

Identified low-income and minority populations in Coconino County could be impacted by management actions under Alternative B. However, the impacts would not be disproportionately adverse, when compared with impacts on the area's population as a whole.

However, as noted in *Nature and Type of Impacts*, disproportionately adverse impacts may occur for ranchers with small-scale operations, which may include those of low-income or minority status.

Discontinuing livestock grazing could also result in differential impacts on tribal populations than those on the general population. Traditional cultural land uses by tribal populations, such as native plant collection, subsistence farming, or wildlife consumption, could be impacted by a no grazing alternative. The potential for the enhancement of native vegetation and a return to natural regimes exists under a no grazing alternative.

Alternative C

Under Alternative C, portions of the decision area would be made unavailable for livestock grazing, resulting in an 18 percent decrease in active AUMs, as compared with Alternative A. In addition, proposed management would result in the potential for additional seasonal restrictions and post-disturbance restrictions to ensure the goals and objectives are met. Impacts from reducing grazing would be similar to those described under Alternative B, but at a reduced scale. Economic impacts from reduced grazing include direct impacts, such as the reduction of wages and revenues for individuals directly tied to the ranching industry, and community-level indirect impacts, including reduced ranching operation revenues, reduced tax revenues, and reduced royalties at the county, state, and federal levels.

Reduced grazing could also allow for the enhancement of native vegetation and wildlife; therefore, differential impacts could occur on tribal populations that use the land for traditional or culturally significant purposes.

Under Alternative C, the impacts would not be disproportionately adverse, when compared with impacts on the area's population as a whole.

Alternative D

Under Alternative D, the decision area would continue to be available for livestock grazing, with a 40 percent increase in active AUMs. In addition, proposed management includes increased flexibility in terms of implementing seasonal and post-disturbance restrictions and the ability to construct and maintain range improvements**{** XE "Range Improvement" **}**. No disproportionate adverse impacts are anticipated from proposed management actions.

Alternative E

Under Alternative E, the decision area would continue to be available for livestock grazing, with a 1 percent decrease in active AUMs. While impacts may occur at the individual or site-specific level, overall, no disproportionate adverse impacts on minority, low-income populations, or Native Americans are anticipated from proposed management actions.

4.22.5 Cumulative Impacts

The cumulative impacts analysis area for environmental justice is the three counties that the planning area falls in (Kane and Garfield Counties in Utah and a small portion of Coconino County in Arizona).

Past, present, and reasonably foreseeable future actions and conditions in the cumulative impact analysis area that have affected and will likely continue to affect low-income and minority populations are those that change the social setting or result in economic impacts on the region, such as state, local, and federal land use decisions involving grazing management, land and realty, and recreation.

As discussed under *Direct and Indirect Impacts*, proposed management actions may impact low-income, minority, and Native American populations who are directly or indirectly connected to the ranching industry. Ranchers generally face a difficult economic environment and frequently note that the ability to use federal grazing land provides an important source of forage that contributes to their economic viability. Past, present, and reasonably foreseeable future actions of federal, state, and local governments will affect the economic environment facing ranchers. Changes to demographic and economic conditions are also likely to be important determinants of the continued economic viability of ranches and the associated social values.

The contribution to cumulative impacts from proposed management under each alternative would parallel the impacts of the alternatives in the general impact analysis, above. In general, management under Alternatives B through E, to a varying degree, would impact the level of permitted grazing and related economic impacts on individuals and communities in the planning areas: low-income, minority, and Native American populations. The greatest contribution to cumulative impacts would be under Alternative B, by making BLM-managed lands in the decision

area unavailable to grazing. This would impact area permittees/lessees economically, including those identified as low income, minority, or Native American. This is because permittees/lessees would be faced with locating replacement forage on lands not administered by the BLM.

Cumulative impacts from each resource or resource use would be greater if the projects were to occur simultaneously.

4.22.6 References

CEQ{ XE "Council on Environmental Quality (CEQ)" } (Council on Environmental Quality). 1997. Environmental Justice Guidance under the National Environmental Policy Act{ XE "National Environmental Policy Act (NEPA)" }. Washington DC. December 10, 1997.

EPA (United States Environmental Protection Agency). 2004. Toolkit for Assessing Potential Allegations of Environmental Injustice. EPA 300-R-04-002. Washington, DC. November 2004.

4.23 Unavoidable Adverse Impacts

Section 102(C) of NEPA{ XE "National Environmental Policy Act (NEPA)" } requires disclosure of any adverse environmental impacts that cannot be avoided, should the proposal be implemented. Unavoidable adverse impacts are those that remain following the implementation of mitigation measures or impacts for which there are no mitigation measures. Some unavoidable adverse impacts occur as a result of implementing the MMP{ XE "Monument Management Plan, Grand Staircase-Escalante National Monument (MMP 2000)" }-A; others are a result of public use of the decision area lands. This section summarizes major unavoidable impacts; discussions of the impacts of each management action (in the discussion of alternatives) provide greater information on specific unavoidable impacts.

Surface-disturbing activities from structural and nonstructural range improvement{ XE "Range Improvement" } could result in unavoidable adverse impacts under current BLM policy to foster multiple uses. Although these impacts would be mitigated to the extent possible, unavoidable damage could be inevitable. Long-term conversion of areas via structural or, in particular, nonstructural range improvements could change the relative abundance of species within plant communities, the relative distribution of plant communities, and the relative occurrence of seral stages of those communities. In areas where livestock is allowed, there could be unavoidable long-term wildlife habitat alteration. These activities could also introduce features that could affect the visual landscape.

Livestock could damage cultural and paleontological resources{ XE "Paleontological Resource" }, if surveys were not conducted in the grazing allotments or if resources were not identified during the field studies. Unavoidable damage to buried cultural resources could occur, particularly where structural range improvements{ XE "Range Improvement" } are constructed.

Livestock could contribute to soil erosion, compaction, and vegetation loss, which could be extensive during drought cycles and dormancy periods, without proper monitoring and management. Some level of competition for forage between livestock and wildlife, although mitigated to the extent possible, would be unavoidable. Instances of displacement, harassment, and injury could also occur.

4.24 Irreversible and Irretrievable Commitment of Resources

Section 102(C) of NEPA{ XE "National Environmental Policy Act (NEPA)" } requires a discussion of any irreversible or irretrievable commitments of resources that are involved in the proposal should it be implemented. An irretrievable commitment of a resource is one in which the resource or its use is lost for a period of time (e.g., livestock grazing). An irreversible commitment of a resource is one that cannot be reversed (e.g., the extinction of a species or disturbance to protected cultural resources). The air quality resource in the planning area is not irreversible or irretrievable.

Implementing the MMP{ XE "Monument Management Plan, Grand Staircase-Escalante National Monument (MMP 2000)" }-A management actions would result in surface-disturbing activities, including constructing structural range improvements{ XE "Range Improvement" } and conducting nonstructural range improvements, which may result in a commitment to the loss of irreversible or irretrievable resources.

The development of structural range facilities is a long-term encumbrance of the land. Although new soil can develop, soil development is a slow process in many parts of the planning area. Soil erosion or the loss of productivity and soil structure may be considered irreversible commitments to resources. Surface-disturbing activities, therefore, could remove vegetation and accelerate erosion that would contribute to irreversible soil loss; however, management actions and BMPs are intended to reduce the magnitude of these impacts and restore some of the soil and vegetation lost.

Primarily because of the number of acres available and greater allowances for a variety of structural and nonstructural range improvements{ XE "Range Improvement" }, such disturbances would occur to the greatest degree under Alternative D; Alternatives A and E would be similar but to a lesser degree, due to fewer acres being available and more restrictions on range improvements.

Alternative C, and to a greater extent Alternative B, contains additional conservation measures, mitigation measures, and restrictions on range improvements{ XE "Range Improvement" } to protect planning area resources.

Laws protecting cultural and paleontological resources{ XE "Paleontological Resource" } would provide for mitigation of irreversible and irretrievable impacts on these resources from livestock grazing.

4.25 Relationship Between Local Short-Term Uses and Long-Term Productivity

Section 102(C) of NEPA{ XE "National Environmental Policy Act (NEPA)" } requires a discussion of the relationship between local short-term uses of the human environment and the maintenance and enhancement of long-term productivity of resources. As described in **Section 4.1.2**, General Method for Analyzing Impacts, "short-term" is defined as anticipated to occur within 1 to 5 years after the action is implemented; "long-term" is defined as following the first 5 years of implementation but within the life of the MMP{ XE "Monument Management Plan, Grand Staircase-Escalante National Monument (MMP 2000)" }-A. For some resources (e.g., air quality and socioeconomics), a 20-year time frame was used to assess long-term impacts.

Across Alternatives A, C, D, and E, the implementation of management actions could result in various short-term impacts, such as localized soil erosion, fugitive dust emission, vegetation loss or damage, wildlife disturbance, and decreased visual resource quality. Structural range improvements{ XE "Range Improvement" } would result in the greatest potential for impacts on long-term productivity. Alternative B would have similar short-term impacts for the first 2 years of the alternative's implementation.

Short-term use of an area for livestock grazing could result in long-term loss of soil productivity and vegetation diversity if not properly managed. Impacts would persist as long as overly intensive grazing continued. In general, the loss of soil productivity would be directly at the point of disturbance, although long-term vegetation diversity and habitat value could be reduced due to fragmentation and the increased potential for invasive species{ XE "Invasive Species" } to spread from the developments or disturbances. Alternatives A, D, and E would have the greatest potential for short-term loss of productivity and diversity, due to the relatively greater number of acres available under these alternatives than under Alternatives B and C.

TABLE OF CONTENTS

Chapter | Page

TABLE OF CONTENTS *(continued)*

Chapter Page

TABLE OF CONTENTS *(continued)*

TABLE OF CONTENTS *(continued)*

Chapter Page

TABLE OF CONTENTS *(continued)*

TABLE OF CONTENTS *(continued)*

Chapter | Page

TABLE OF CONTENTS *(continued)*

FIGURES

Page

TABLES

Page

TABLES *(continued)*

Page

TABLES *(continued)* Page

APPENDICES

ACRONYMS AND ABBREVIATIONS

	Full Phrase
µg/m³	micrograms per cubic meter
ACEC	Area of Critical Environmental Concern
AGFD	Arizona Game and Fish Department
AIM	Assessment, Inventory, and Monitoring
AIRFA	American Indian Religious Freedom Act
AUM	animal unit month
ASFO	Arizona Strip Field Office
BLM	United States Department of the Interior, Bureau of Land Management
BMP	best management practice
CEQ	Council on Environmental Quality
CFR	Code of Federal Regulations
CO2e	carbon dioxide equivalents
DEQ	Utah Department of Environmental Quality
DOI	United States Department of the Interior
EIS	environmental impact statement
EPA	United States Environmental Protection Agency
ERMA	extensive recreation management area
ESA	Endangered Species Act
ESD	Ecological Site Description
°F	degrees Fahrenheit
FAR	functioning-at-risk
FLPMA	Federal Land Policy and Management Act of 1976
Glen Canyon	Glen Canyon National Recreation Area
GMP	Glen Canyon National Recreation Area General Management Plan
GSENM	Grand Staircase-Escalante National Monument
GzMP	Glen Canyon National Recreation Area Grazing Management Plan
IM	instruction memorandum
IMPLAN	Impact Analysis for Planning
ISA	Instant Study Area
JEDI	Jobs and Economic Development Impact
KFO	Kanab Field Office
LDS	Church of Jesus Christ of Latter-Day Saints
MFP	management framework plan
MMP	monument management plan
MMP-A	monument management plan amendment

ACRONYMS AND ABBREVIATIONS *(continued)*

	Full Phrase
NAAQS	National Ambient Air Quality Standards
NAGPRA	Native American Graves Protection and Repatriation Act
NEPA	National Environmental Policy Act of 1969
NF	nonfunctional
NHPA	National Historic Preservation Act
NPS	United States Department of the Interior, National Park Service
NRCS	United States Department of Agriculture, Natural Resources Conservation Service
NRHP	National Register of Historic Places
NRPH	National Range and Pasture Handbook
NVCS	National Vegetation Classification System
NWSRS	National Wild and Scenic River System
OHV	off-highway vehicle
ORV	outstandingly remarkable value
PAC	protected activity center
PFC	proper functioning condition
PFYC	potential fossil yield classification
PHMA	Priority Habitat Management Area
PM_{10}	particulate matter less than 10 microns in diameter
$PM_{2.5}$	particulate matter less than 2.5 microns in diameter
ppb	parts per billion
ppm	parts per million
REA	rapid ecoregional assessment
Redwood Amendment	Redwood National Park Expansion Act of 1978
RIMS II	Regional Input Output Modeling System
RMP	resource management plan
ROD	Record of Decision
ROW	right-of-way
SHPO	State Historic Preservation Office
SITLA	State of Utah School and Institutional Trust Lands Administration
SRMA	Special Recreation Management Area
TCP	traditional cultural property
UDWR	Utah Division of Wildlife Resources
USC	United States Code
USFWS	United States Department of the Interior, Fish and Wildlife Service
VRI	visual resource inventory
VRM	visual resource management
WSA	Wilderness Study Area
WSR	wild and scenic rivers

This page intentionally left blank.

ACRONYMS AND ABBREVIATIONS *(continued)* Full Phrase

DON'T DELETE THIS PAGE – NECESSARY FOR TOC GENERATION (throw away/delete from PDF)

{ RD "201701_0_ExecSum_ADEIS_WO-Rvw.docx" \f **}**
{ RD "201701_1_Intro_ADEIS_WO-Rvw.docx" \f **}**
{ RD "201701_2_Alts_ADEIS_WO-Rvw.docx" \f **}**
{ RD "201701_3_AE_ADEIS_WO-Rvw.docx" \f **}**
{ RD "201701_4_EC_ADEIS_WO-Rvw.docx" \f **}**
{ RD "201701_5_ConsultCoord_ADEIS_WO-Rvw.docx" \f **}**

Chapter 5

Consultation and Coordination

TABLE OF CONTENTS

TABLES

This page intentionally left blank.

5. Consultation and Coordination

DO NOT DELETE THIS PAGE from the MS Word file, as this is what marks Heading 1 for the table of contents. (Do delete this page later from the Adobe Acrobat [pdf] file.)

THROW THIS PAGE AWAY & DELETE FROM PDF

CHAPTER 5
CONSULTATION AND COORDINATION

This chapter describes the efforts undertaken by the BLM throughout the process of developing the MMP{ XE "Monument Management Plan, Grand Staircase-Escalante National Monument (MMP 2000)" }-A/EIS to ensure the process remained open and inclusive. This chapter also describes efforts taken to comply with legal requirements to consult and coordinate with various government agencies. This chapter also lists the tribal and local governments and agencies that received a copy of the Draft MMP-A/EIS.

The BLM land use planning activities are conducted in accordance with NEPA{ XE "National Environmental Policy Act (NEPA)" } requirements, CEQ{ XE "Council on Environmental Quality (CEQ)" } regulations, and DOI policies and procedures implementing NEPA, as well as specific BLM planning and NEPA policies. The NEPA and associated laws, regulations, and policies require the BLM to seek public involvement early in and throughout the planning process to develop a range of reasonable alternatives to proposed actions and to prepare environmental documents that disclose the potential impacts of proposed alternatives.

Public involvement and agency consultation and coordination have been at the heart of the planning process leading to the Draft MMP{ XE "Monument Management Plan, Grand Staircase-Escalante National Monument (MMP 2000)" }-A/EIS. These efforts were achieved through Federal Register notices, public meetings, individual contacts, media press releases, planning newsletters, and website updates. This chapter documents the outreach efforts that have occurred to date. Additional efforts will continue as the planning process continues.

5.1 PUBLIC INVOLVEMENT

Public involvement entails "The opportunity for participation by affected citizens in rule making, decision making, and planning with respect to the public lands, including public meetings or hearings...or advisory mechanisms, or other such procedures as may be necessary to provide public comment in a particular instance" (FLPMA{ XE "Federal Land Policy and Management Act (FLPMA)" }, Section 103[d]). The CEQ{ XE "Council on Environmental Quality (CEQ)" } regulations and BLM planning regulations both provide for specific points of public involvement in the land use planning and NEPA{ XE "National Environmental Policy Act (NEPA)" } processes

to address local, regional, and national interests (see 43 CFR, Part 1610.2, and 40 CFR, Part 1506.6). Guidance for public participation on NPS-managed lands is found in Section 4.8 of Director's Order 12 and associated handbook. The BLM and NPS has designed public involvement efforts throughout the MMP{ XE "Monument Management Plan, Grand Staircase-Escalante National Monument (MMP 2000)" }-A/EIS process to meet the requirements of FLPMA, NEPA, and the NHPA{ XE "National Historic Preservation Act (NHPA)" }.

Public involvement for this planning effort includes the following:

- Scoping{ XE "Scoping" } meetings and other forms of outreach requesting public comments to help determine the scope of issues and alternatives to be addressed (see **Section 5.1.1**, Scoping)
- Public outreach via newsletters, news releases, the project website, and other media

5.2 Coordination with Federal, State, Local, and Tribal Governments, the Advisory Council, and Cooperating Agencies (see Section 5.1,

5.2.1 Consultation, and Section 5.1.1,

5.2.2 Section 106 Consultation

The NHPA{ XE "National Historic Preservation Act (NHPA)" } Section 106 comment process began in conjunction with the NEPA{ XE "National Environmental Policy Act (NEPA)" } process for the EIS. At the public scoping meetings, the BLM had a table set up for presenting and discussing the Section 106 process and for soliciting comments. The agency received very few comments during these meetings pertinent to cultural resources, as defined by the NHPA (e.g., potential grazing impacts on Native American sites). However, some comments that were received suggested that the BLM did not recognize the importance of the ranching history and livestock grazing in the planning area or its importance to the continuation of a certain way of life and the economy.

The BLM invited all those who provided comments on cultural resource issues to become consulting parties. The agency sent letters to 172 parties on the mailing list and sent e-mails to 649 others.

The following entities responded with a request to become consulting parties:

State Agencies or Entities, Local Governments, and Tribes

- Advisory Council on Historic Preservation
- Arizona State Historic Preservation Office{ XE "State Historic Preservation Office (SHPO)" }
- Arizona State Lands Department
- Canyonlands Conservation District
- City of Panguitch
- City of Tropic
- Garfield County
- Hopi Tribe
- Kaibab Band of Paiutes
- Kane County
- Utah SITLA
- Utah Public Lands Policy Coordination Office
- Utah State Historic Preservation Office{ XE "State Historic Preservation Office (SHPO)" }
- Utah State University Extension

Nongovernmental Organizations

- Church of Jesus Christ Latter Day Saints, Church History Department
- Grand Canyon Trust
- Grand Staircase-Escalante Partners
- Great Old Broads for Wilderness

- National Parks Conservation Association
- The Wilderness Society BLM Action Center
- Western Watersheds Project
- Yellowstone to Uintas Connection

In addition to those listed above, a number of permittees and other concerned citizens responded requesting to be consulting parties.

Also invited, but not accepting the invitation, were the Hualapai Tribe, Navajo Nation, Paiute Indian Tribes of Utah, Pueblo of Zuni, San Juan Southern Paiute Tribe, Ute Mountain Ute, and Ute Tribe of the Uintah and Ouray Reservation.

In addition to the scoping meetings, the BLM hosted Section 106 consultation meetings with the consulting parties, cooperating agencies, and interested members of the public (see **Table 5-5**, Consulting Party Meetings). These meetings were to discuss the background of the NHPA**{** XE "National Historic Preservation Act (NHPA)" **}**, Section 106 legal responsibilities, potential impacts of the undertaking on cultural resources, background on the cultural resources in GSENM, and the BLM's efforts to identify the current condition of cultural resources across the area of potential effect. Also included were discussions on a proposed grazing history of the area and a request to submit known archaeological and historical sites and information related to grazing history. Information and input received during these meetings was used to inform the development of the programmatic agreement (see **Appendix E**). All consulting party meetings were concluded with a question-and-answer session.

Table 5-5
Consulting Party Meetings

Meeting Invitees	Date	Location
Kaibab Band of Paiutes	December 19, 2014	Kaibab Band of Paiutes Reservation
All consulting parties and cooperating agencies	January 22, 2016	Kanab, Utah
Kaibab Band of Paiutes	February 29, 2016	Kaibab Band of Paiutes Reservation
All consulting parties and cooperating agencies	March 15, 2016	Cannonville, Utah
Hopi Tribe	March 23, 2016	Hopi Reservation
All consulting parties and cooperating agencies	June 8, 2016	Cannonville, Utah

As an outgrowth of the MMP**{** XE "Monument Management Plan, Grand Staircase-Escalante National Monument (MMP 2000)" **}**-A/EIS and consulting party meetings, GSENM has begun the production of a Kane and Garfield Counties Grazing History. This informational document is scheduled for release in late 2017 or early 2018.

- Coordination)

5.2.3 Public review of the Draft MMP{ XE "Monument Management Plan, Grand Staircase-Escalante National Monument (MMP 2000)" }-A/EIS (see Section 5.2.8, Other Outreach

In August, 2014, the BLM held a biological soil crust{ XE "Biological Soil Crust" } forum at the Kanab public library and opened it to the public. The forum included panel discussion from members of the scientific community who are recognized as experts on the ecosystem function of biological soil crust. While the forum was educational in nature, it also informed the BLM on the importance of biological soil crust and the BLM incorporated aspects of protection of biological soil crusts into the alternatives.

In August, 2015, the BLM also held a rangeland treatments forum. This forum was primarily focused on informing the public and other interested parties of the types of range improvements{ XE "Range Improvement" } that the BLM engages in and what they look like on the landscape. One day of the forum was held in Kanab at the BLM and the second day of the forum included a field visit to look at what the various treatments look like on the landscape.

- Future Public Involvement Opportunities)

5.2.4 Scoping{ XE "Scoping" }

Scoping{ XE "Scoping" }, as required by 40 CFR, Subpart 1501.7, is an early and open process for determining the scope of issues to be addressed and identifying the significant issues related to a proposed action. Information collected during scoping may also be used to develop the alternatives to be addressed in an EIS. The process has two components: internal scoping and external scoping.

Internal scoping is conducted within the BLM and with cooperating agencies to help determine what needs to be analyzed in the EIS. It is used to define issues, alternatives, and data needs. It may also be used to formulate and refine the purpose and need; identify any connected, cumulative, or similar actions associated with the proposal; start preparation for cumulative impacts analysis; decide the appropriate level of NEPA{ XE "National Environmental Policy Act (NEPA)" } documentation (i.e., an environmental assessment or an EIS); develop a public involvement strategy; and decide other features of the NEPA process (BLM 2008).

External scoping involves notification and opportunities for feedback from other agencies, organizations, tribes, local governments, and the public. It can be used to identify coordination needs with other agencies; refine issues through feedback on preliminary issues; identify new issues and possible alternatives; and begin identifying past, present, and reasonably foreseeable actions by others that could have a cumulative impact together with the BLM action. The intent of scoping is to focus the analysis on significant issues and reasonable alternatives, to eliminate extraneous discussion, and to reduce the length of the EIS (BLM 2008).

While CEQ{ XE "Council on Environmental Quality (CEQ)" } regulations do not provide a standard duration for scoping periods, BLM land use planning guidance requires a minimum 30-day formal scoping period (BLM Handbook H-1601-1 [BLM 2005]). Formal public scoping begins following the publication of a Notice of Intent in the *Federal Register* (discussed below). Informal internal and external scoping may occur before the formal public scoping period begins.

According to 43 CFR Part 1610.2(d), the BLM shall document public participation activities by a record or summary of the principal issues discussed and comments made. To satisfy this requirement for scoping, the BLM's NEPA{ XE "National Environmental Policy Act (NEPA)" } guidance (Handbook H-1790-1 [BLM 2008]) requires the preparation of a scoping report. In this report are discussions of the issues raised during the scoping process, the issues to be addressed in the EIS, the issues that will not be addressed in the EIS and why, a list of participants in the scoping process, and the views of those participants.

Notice of Intent

The BLM published a Notice of Intent to prepare the GSENM Livestock Grazing MMP{ XE "Monument Management Plan, Grand Staircase-Escalante National Monument (MMP 2000)" }-A/EIS on November 4, 2013 (78 *Federal Register* 66064-660657). The Notice of Intent initiated the formal public scoping period. The public scoping period ended on January 13, 2014, 30 days after the last public scoping meeting. The public scoping period lasted 70 days, more than double the minimum required for BLM land use planning efforts.

Scoping{ XE "Scoping" } Newsletter and Mailing List

In November 2013, the BLM mailed a newsletter announcing the public scoping period. The newsletter was sent to more than 350 individuals, agencies, and organizations. It provided the dates and venues for the three scoping meetings (see ***Public Scoping{ XE*** "Scoping" **}** ***Meetings***, below), included project background information, decisions to be made, a planning timeline, preliminary planning criteria{ XE "Planning Criteria" } and planning issues{ XE "Planning Issues" }, and a description of the various methods for submitting comments, including dedicated electronic and postal mail addresses.

Press Releases and Other Media Coverage

A press release announcing the scoping period was sent to local media outlets and was posted on the project website on November 1, 2013. The press release provided the dates and locations of the scoping meetings (see ***Public Scoping{ XE*** "Scoping" **}** ***Meetings***, below). It also described the various methods for submitting comments. The press release was published on KCSG Television's website on November 1, 2013, and in the *Wayne & Garfield County Insider* on November 7, 2013.

A second press release, issued on November 27, 2013, provided additional details about the scoping meetings (see ***Public Scoping{ XE*** "Scoping" **}** ***Meetings***, below) and described the various methods for submitting comments. The press release was published in the *Wayne & Garfield County Insider* on December 5, 2013, and in *Deseret News* on December 6, 2013.

Two newspapers are known to have published articles covering the MMP{ XE "Monument Management Plan, Grand Staircase-Escalante National Monument (MMP 2000)" }-A/EIS scoping period. **Table 5-1**, Scoping{ XE "Scoping" } Period Newspaper Articles, displays each newspaper's publication date of the articles.

Table 5-1
Scoping{ XE "Scoping" } Period Newspaper Articles

Newspaper	Date(s) Article(s) Appeared

Table 5-1
Scoping{ XE "Scoping" } Period Newspaper Articles

Newspaper	Date(s) Article(s) Appeared
Salt Lake Tribune	November 1, 2013; December 6, 2013
Wayne & Garfield County Insider	November 14, 2013

Additionally, "The County Seat," a Utah-based television program highlighting local issues, ran a piece explaining the planning effort and the implications of changes to grazing on cattlemen and counties.

Public Scoping{ XE "Scoping" } Meetings

The BLM hosted three scoping meetings to provide the public with opportunities to become involved, learn about the project and the planning process, meet the GSENM MMP{ XE "Monument Management Plan, Grand Staircase-Escalante National Monument (MMP 2000)" }-A/EIS team members, and offer comments. As shown in **Table 5-2**, Scoping{ XE "Scoping" } Meetings, 107 people signed in at the meetings. The meetings were advertised via press release, the project newsletter, the project website, and via phone calls from BLM staff to potentially interested grazing permit{ XE "Permit, Grazing" }tees. The locations of the meetings are provided in **Table 5-2**.

Table 5-2
Scoping{ XE "Scoping" } Meetings

Location (Utah)	Venue	Date (2013)	Number of Attendees*	Number of Completed Comment Forms Received
Kanab	BLM Administrative Complex	December 10	35	1
Escalante	Interagency Visitor Center	December 11	56	1
Salt Lake City	Main Library	December 12	16	1
		Total	***107***	***3***

*Denotes the number of attendees who signed in; additional attendees were present in some locations.

The meetings began with a presentation given by Ms. Sarah Schlanger, (former) Associate GSENM Manager, followed by an open house. Garfield County Commissioner Mr. Leland Pollock also gave a speech at the Escalante meeting regarding Garfield County's role as a cooperating agency. During the open house, participants were encouraged to discuss concerns and questions with BLM and NPS staff representatives. Copies of the first issue of the project newsletter, a guide to providing substantive comments, and information regarding upcoming workshops and seminars (including socioeconomic workshops to be conducted as part of the project) were available at the sign-in station.

Blank scoping comment forms were available at a commenting table where participants could write and submit comments at the meetings. Resource posters were displayed showing the planning area, current livestock grazing allotments, range productivity, vegetation types,

recreation management, and special designations. Ten additional resource fact sheets and project-related handouts provided an overview of current management practices and issues.

Scoping{ XE "Scoping" } Comments Received

GSENM received a total of 564 written submissions during the public scoping period, comprising 205 separate submissions and one form letter, resulting in 1,287 discrete comments. Detailed information about the comments received and about the public outreach process can be found in the GSENM Livestock Grazing Plan Amendment EIS Scoping{ XE "Scoping" } Report, finalized in May 2014 (BLM 2014). The issues identified during public scoping and outreach helped refine the list of planning issues{ XE "Planning Issues" }, included in Chapter 1, **Section 1.5.2**, Scoping, Issue Identification which guided the development of alternative management strategies for the MMP{ XE "Monument Management Plan, Grand Staircase-Escalante National Monument (MMP 2000)" }-A.

5.2.5 Additional Newsletters

In addition to the November 2013 scoping newsletter (see **Section 5.2.4**, Scoping{ XE "Scoping" }), the BLM published additional project newsletters in July 2014 (providing scoping results), December 2014 (announcing preliminary draft alternatives), August 2015 (providing project updates), and June 2016 (announcing alternatives selected for detailed study).

5.2.6 Project Website

The BLM maintains a project website to keep the public informed about the MMP{ XE "Monument Management Plan, Grand Staircase-Escalante National Monument (MMP 2000)" }-A/EIS process. The website is https://eplanning.blm.gov/epl-front-office/eplanning/planAndProjectSite.do?methodName=renderDefaultPlanOrProjectSite&projectId=69026 and contains background information, maps, status updates, and other material.

5.2.7 Socioeconomic Workshops

On January 15, 16, and 17, 2014, the BLM hosted a series of community socioeconomic workshops in Escalante, Kanab, and Cannonville, Utah, respectively. The BLM encouraged ranchers, community leaders, and other interested individuals to participate in these workshops. Participants worked with BLM natural resource specialists to develop representative scenarios describing typical ways in which the ranches of different sizes and types use public and private lands in the GSENM region as part of their ranching operations. The BLM used these scenarios as the basis for an economic analysis, in which the BLM evaluated EIS alternatives for their social and economic impacts. In total, 80 citizens, federal and local government representatives, and local interest group representatives signed in at the workshops (additional attendees were present in some locations but did not sign in).

5.2.8 Public Involvement in the Preliminary Draft Alternatives

The BLM developed a range of alternatives based on the issues presented in the GSENM Livestock Grazing Plan Amendment EIS Scoping{ XE "Scoping" } Report, finalized in May 2014 (BLM 2014) and guided by established planning criteria{ XE "Planning Criteria" } (as outlined in 43 CFR, Part 1610) (see Chapter 1, **Section 1.5.3**, Planning Criteria). In compliance with the NEPA{ XE "National Environmental Policy Act (NEPA)" }, FLPMA{ XE "Federal Land Policy and Management Act (FLPMA)" }, CEQ{ XE "Council on Environmental Quality (CEQ)" }

regulations, and BLM planning regulations and guidance, the BLM developed a preliminary draft range of alternatives that address the identified planning issues{ XE "Planning Issues" } (Chapter 1, **Section 1.5.2**, Scoping, Issue Identification), explore opportunities to enhance management of resources and resource uses, resolve conflicts among resources and resource uses, meet the purpose of and need for the MMP{ XE "Monument Management Plan, Grand Staircase-Escalante National Monument (MMP 2000)" }-A, are capable of implementation, and are feasible.

Five preliminary alternatives were developed in close coordination with the cooperating agencies (see **Section 5.4.1**, Cooperating Agencies). The preliminary alternatives proposed different scenarios for managing livestock and rangelands in the planning area. Planning issues{ XE "Planning Issues" } raised during scoping and addressed in the alternatives are general livestock grazing topics, livestock grazing management practices, livestock grazing forage availability and allocation, and rangeland health{ XE "Rangeland Health" }. The BLM made the preliminary draft alternatives publicly available in December 2014.

Press Releases and Other Media Coverage

On November 18, 2014, the BLM issued a press release, inviting the public to three preliminary alternatives meetings to be held in Salt Lake City, Kanab, and Escalante. The press release was e-mailed to 640 individuals, agencies, and organizations. It provided the dates and venues for the meetings and a description of the various methods for submitting comments and provided dedicated e-mail and postal mail addresses. The press release was published in local newspapers: *Wayne & Garfield County Insider* (November 20, 2014), *Southern Utah News* (November 20, 2014), *Deseret News* (November 24, 2014), and *St. George News* (November 29, 2014).

Project Website

The preliminary draft alternatives were available on the project website (see **Section 5.2.6**, Project Website).

Public Meetings on the Preliminary Draft Alternatives

The BLM hosted three public meetings to provide the public with opportunities to become involved, to learn about the project and the planning process, to meet GSENM MMP{ XE "Monument Management Plan, Grand Staircase-Escalante National Monument (MMP 2000)" }-A/EIS team members, and to offer comments on the preliminary alternatives. As shown in **Table 5-3**, Preliminary Alternatives Public Meetings, 80 people signed in at the meetings. The meetings were advertised via press release, the project newsletter, the project website, and phone calls from BLM staff to potentially interested grazing permit{ XE "Permit, Grazing" }tees.

Table 5-3
Preliminary Alternatives Public Meetings

Location (Utah)	Venue	Date (2014)	Number of Attendees*	Number of Completed Comment Forms Received
Salt Lake City	Utah State Capitol Building	December 2	15	1
Kanab	Kane County Search and Rescue Facility	December 3	28	0
Escalante	Interagency Visitor	December 4	37	0

Table 5-3
Preliminary Alternatives Public Meetings

Location (Utah)	Venue	Date (2014)	Number of Attendees*	Number of Completed Comment Forms Received
	Center			
		Total	***80***	***1***

*Denotes the number of attendees who signed in; additional attendees were present at some locations.

The meetings began with a brief presentation given by Ms. Cynthia Staszak, GSENM Manager, then followed by an open house, during which participants were encouraged to discuss concerns and questions with BLM and NPS staff representatives. Copies of the following documents were available at the sign-in station: project newsletter #3 (which included a summary and comparison of the alternatives), a summary of the preliminary alternatives, and a detailed narrative of the preliminary alternatives. Other information about GSENM was also available. These materials were also available on the project website.

Blank preliminary alternatives comment forms were available at a commenting table where participants could write and submit comments at the meetings. Resource posters were displayed showing the planning area, acres available and unavailable for livestock grazing under each of the preliminary alternatives, and a timeline for the livestock grazing plan amendment NEPA**{** XE "National Environmental Policy Act (NEPA)" **}** process. Additionally, commenters were given the opportunity to rank the issues identified during scoping as Not Important, Somewhat Important, or Very Important on poster displays. The GSENM Livestock Grazing Plan Amendment EIS Preliminary Alternatives Comment Report (BLM 2016) provides results.

Preliminary Draft Alternatives Comments Received

Public comments on the preliminary draft alternatives that were received or postmarked by January 26, 2015, were evaluated and documented in the GSENM Livestock Grazing Plan Amendment EIS Preliminary Alternatives Comment Report (BLM 2016). The BLM received 367 written submissions (including form letters) containing 1,031 discrete comments during that period. The majority (64 percent) of the comments suggested changes to a preliminary alternative, suggested an entirely new alternative, or suggested that the BLM choose a combination of actions in the preliminary alternatives. Of these comments, 240 (36 percent) related to livestock grazing issues including allotment boundaries, grazing permits**{** XE "Permit, Grazing" **}**, AUMs, and range improvements**{** XE "Range Improvement" **}**. The GSENM Livestock Grazing Plan Amendment EIS Preliminary Alternatives Comment Report (BLM 2016) analyzes the comments in more detail.

5.2.9 Based on public comments, cooperating agency coordination, and internal preliminary draft alternatives, the alternatives were modified as described in Livestock Grazing Plan Amendment EIS Preliminary Alternatives Comment The modified alternatives are analyzed in this Draft EIS (see Section 5.2.9, Other Outreach

In August, 2014, the BLM held a biological soil crust**{** XE "Biological Soil Crust" **}** forum at the Kanab public library and opened it to the public. The forum included panel discussion from

members of the scientific community who are recognized as experts on the ecosystem function of biological soil crust. While the forum was educational in nature, it also informed the BLM on the importance of biological soil crust and the BLM incorporated aspects of protection of biological soil crusts into the alternatives.

In August, 2015, the BLM also held a rangeland treatments forum. This forum was primarily focused on informing the public and other interested parties of the types of range improvements{ XE "Range Improvement" } that the BLM engages in and what they look like on the landscape. One day of the forum was held in Kanab at the BLM and the second day of the forum included a field visit to look at what the various treatments look like on the landscape.

Future Public Involvement Opportunities).

5.2.10 Other Outreach

In August, 2014, the BLM held a biological soil crust{ XE "Biological Soil Crust" } forum at the Kanab public library and opened it to the public. The forum included panel discussion from members of the scientific community who are recognized as experts on the ecosystem function of biological soil crust. While the forum was educational in nature, it also informed the BLM on the importance of biological soil crust and the BLM incorporated aspects of protection of biological soil crusts into the alternatives.

In August, 2015, the BLM also held a rangeland treatments forum. This forum was primarily focused on informing the public and other interested parties of the types of range improvements{ XE "Range Improvement" } that the BLM engages in and what they look like on the landscape. One day of the forum was held in Kanab at the BLM and the second day of the forum included a field visit to look at what the various treatments look like on the landscape.

5.2.11 Future Public Involvement Opportunities

Draft MMP{ XE "Monument Management Plan, Grand Staircase-Escalante National Monument (MMP 2000)" }-A and EIS

Members of the public will have the opportunity to comment on this Draft MMP{ XE "Monument Management Plan, Grand Staircase-Escalante National Monument (MMP 2000)" }-A/EIS during a minimum 90-day public comment period. The BLM announced the availability of the draft document via a Notice of Availability in the *Federal Register*, and a 90-day public comment period followed. A press release announcing the availability of the Draft MMP-A/EIS was posted on the project website. The Draft MMP-A/EIS is available on the project website and at the BLM State Office (in Salt Lake City) and GSENM (in Kanab). Notification of the Draft MMP-A/EIS was provided to cooperating agencies and tribal representatives. The BLM will hold public meetings near the planning area during the 90-day comment period.

Distribution of the Draft MMP{ XE "Monument Management Plan, Grand Staircase-Escalante National Monument (MMP 2000)" }-A/EIS

The BLM provided a copy (paper or CD) of the Draft MMP{ XE "Monument Management Plan, Grand Staircase-Escalante National Monument (MMP 2000)" }-A/EIS to tribal, local, state, and federal governments and agencies (**Table 5-4**, Draft MMP-{ XE "Monument Management Plan, Grand Staircase-Escalante National Monument (MMP 2000)" }A/EIS Distribution). Individuals and organizations may download the documents from the MMP-A website, review a paper copy at the BLM State Office or GSENM office, or request a CD. *[BLM: Please revise this list (Table 5-4) to reflect distribution of the public Draft MMP-A/EIS.]*

Table 5-4
Draft MMP-{ XE "Monument Management Plan, Grand Staircase-Escalante National Monument (MMP 2000)" }A/EIS Distribution

Tribal Governments	
• Hopi Tribe of Arizona • Kaibab Band of Paiute Indians • Navajo Nation	• Paiute Indian Tribe of Utah • Pueblo of Zuni • Ute Indian Tribe of the Uintah and Ouray Reservation
Local Governments (Counties, Cities, Towns)	
• Coconino County, Arizona • Garfield County, Utah • Kane County, Utah • Town of Alton • Town of Big Water • Town of Boulder	• Town of Cannonville • Town of Escalante • Town of Hatch • Town of Henrieville • City of Kanab • Town of Tropic
Utah State Agencies, Boards, and Commissions	
• Department of Natural Resources o Division of Wildlife Resources o Utah State Parks, Anasazi State Park • State Historic Preservation Officer{ XE "State Historic Preservation Office (SHPO)" }	• Department of Environmental Quality o Air Quality Division o Water Quality Division • Public Lands Policy Coordinating Office
US Department of the Interior	
• BLM o Washington, DC o Utah State Office o Arizona Strip Field Office, Arizona o Kanab Field Office, Utah o Monticello Field Office, Utah o Richfield Field Office, Utah o GSENM Big Water Visitor Center o GSENM Cannonville Visitor Center o GSENM Escalante Interagency Office o GSENM Kanab Visitor Center	• National Park Service o Denver, CO o Washington, DC o Glen Canyon National Recreation Area o Bryce Canyon National Park o Capitol Reef National Park • Office of Environmental Policy and Compliance • USFWS o Region 6, Denver, CO o Utah Ecological Services Office
Other Federal Agencies	
• EPA, Region VIII	• US Department of Agriculture, Natural

Table 5-4
Draft MMP-{ XE "Monument Management Plan, Grand Staircase-Escalante National Monument (MMP 2000)" }A/EIS Distribution

• US Department of Agriculture, Forest Service, Dixie National Forest	Resources Conservation Service

Proposed MMP{ XE "Monument Management Plan, Grand Staircase-Escalante National Monument (MMP 2000)" }-A and Final EIS

At the conclusion of the Daft MMP{ XE "Monument Management Plan, Grand Staircase-Escalante National Monument (MMP 2000)" }-A/EIS public comment period, the BLM will review and analyze public comments and determine what changes need to be made to the document. The BLM will then revise the Draft MMP-A/EIS and will prepare a Proposed MMP-A/Final EIS. The Proposed MMP-A/Final EIS will respond to all substantive comments on the Draft MMP-A/EIS received during the official comment period. The Proposed MMP-A/Final EIS will then be published. The BLM will announce the availability of the Proposed MMP-A/Final EIS in the *Federal Register*. Following the Notice of Availability, the BLM will open a 30-day protest period. Concurrently, the BLM will request the governors of Utah and Arizona to review the Proposed MMP-A/Final EIS for consistency with approved state and local plans, policies, and programs.

Approved MMP{ XE "Monument Management Plan, Grand Staircase-Escalante National Monument (MMP 2000)" }-A and ROD

At the conclusion of the public protest period and the Governor's consistency review, the BLM will resolve all protests and any inconsistencies. If necessary, the BLM will publish a notice in the *Federal Register* requesting public comment on significant changes made as a result of protest. The BLM will then prepare the approved MMP{ XE "Monument Management Plan, Grand Staircase-Escalante National Monument (MMP 2000)" }-A and ROD. The NPS will also prepare a ROD and will make a determination regarding impairment of Glen Canyon values and purposes. The BLM and NPS will announce the availability of these documents in the *Federal Register*.

5.3 Consultation

Various federal laws require the BLM to consult with American Indian Tribes, the SHPO{ XE "State Historic Preservation Office (SHPO)" }, USFWS, and the EPA during the planning/NEPA{ XE "National Environmental Policy Act (NEPA)" } decision-making process. In addition, the BLM consulted under Section 106 of the NHPA{ XE "National Historic Preservation Act (NHPA)" }, which included consultation with American Indian tribes and the SHPO. This section documents the specific consultation and coordination efforts undertaken throughout the process of developing the MMP{ XE "Monument Management Plan, Grand Staircase-Escalante National Monument (MMP 2000)" }-A/EIS.

5.3.1 Tribes

In accordance with the NHPA{ XE "National Historic Preservation Act (NHPA)" } and several other legal authorities (see BLM Manual 8120 [BLM 2004]), and in recognition of the government-to-government relationship between individual tribes and the federal government, the BLM has initiated tribal consultation efforts related to preparation of this MMP{ XE "Monument Management Plan, Grand Staircase-Escalante National Monument (MMP 2000)" }-A.

Two tribes, the Kaibab Paiute Tribe and the Paiute Tribe of Utah, were invited to be cooperating agencies in May 2013. The Paiute Tribe of Utah formally declined, and the BLM received no response from the Kaibab Paiute Tribe. (Cooperating agency activities are discussed generally in **Section 5.4.1**, Cooperating Agencies.) On October 25, 2013, and November 7, 2013, the BLM sent scoping letters to tribal governments providing initial notification of the MMP**{** XE "Monument Management Plan, Grand Staircase-Escalante National Monument (MMP 2000)" **}**-A and background information on the project. These letters were sent to the six identified tribes with cultural ties to areas in GSENM: Navajo Nation, San Juan Southern Paiute Tribe, Hopi Tribe, Pueblo of Zuni, Paiute Indian Tribe of Utah, and the Kaibab Paiute Tribe.

The Hopi Tribe provided a letter on December 30, 2013, in response to initial scoping. They requested continued consultation and expressed concerns with grazing-related impacts on cultural resources. The letter writers supported the long-term elimination of grazing in GSENM. In a follow-up letter on November 4, 2014, they reiterated these points. On October 21, 2014, the BLM sent letters formally initiating Section 106 consultation with the tribes (see **Section 5.2.5**, Section 106 Consultation). Letters were sent to all six tribes previously mentioned, plus the Ute Mountain Ute, Ute Tribe of the Uintah and Ouray Reservation, Hualapi Tribe, and the Kaibab Band of Paiute Indians. The Paiute Indian Tribe of Utah declined to be a consulting party.

The Navajo Nation provided a letter to the BLM on January 22, 2015, with questions and comments about GSENM's cultural resources, TCPs**{** XE "Traditional Cultural Property (TCP)" **}** in the planning area, and the MMP**{** XE "Monument Management Plan, Grand Staircase-Escalante National Monument (MMP 2000)" **}**-A/EIS process in general.

Prior to publishing the Draft MMP**{** XE "Monument Management Plan, Grand Staircase-Escalante National Monument (MMP 2000)" **}**-A/EIS, the BLM sent another letter to the tribes noted above informing them again of the planning effort and again offering formal consultation. All of these tribes were also provided a newsletter concerning publication of the Draft MMP-A/EIS and its availability for public review and comment.

Beyond these formal communications, no other written comments were received from tribal agencies. Tribal concerns or issues have been typically presented in oral format. Government-to-government consultation and coordination has been and will continue to be ongoing throughout the MMP**{** XE "Monument Management Plan, Grand Staircase-Escalante National Monument (MMP 2000)" **}**-A process to ensure that the concerns of tribal groups are considered.

5.3.2 Utah State Historic Preservation Office{ XE "State Historic Preservation Office (SHPO)" }r Consultation

The NHPA**{** XE "National Historic Preservation Act (NHPA)" **}** and regulations at 36 CFR Part 800 govern the BLM's cultural resource management programs. The regulations provide specific procedures for consultation between the BLM and the SHPO**{** XE "State Historic Preservation Office (SHPO)" **}**. The Draft MMP**{** XE "Monument Management Plan, Grand Staircase-Escalante National Monument (MMP 2000)" **}**-A/EIS was provided to the State Historic Preservation Officer concurrently with its release to the public.

5.3.3 US Fish and Wildlife Service Consultation

To comply with Section 7(c) of the ESA{ XE "Endangered Species Act (ESA)" } of 1973, the BLM invited the US Fish and Wildlife Service early in the planning process to be a cooperating agency. The BLM will consult with US Fish and Wildlife Service to develop the draft Biological Assessment, which will be prepared after public comments are received on the Draft MMP{ XE "Monument Management Plan, Grand Staircase-Escalante National Monument (MMP 2000)" }-A/EIS.

5.3.4 US Environmental Protection Agency

The NEPA{ XE "National Environmental Policy Act (NEPA)" } regulations require that EISs be filed with the EPA for review and comment (40 CFR 1506.9). The BLM will provide the EPA with a copy of the Draft MMP{ XE "Monument Management Plan, Grand Staircase-Escalante National Monument (MMP 2000)" }-A/EIS for review and comment.

5.3.5 Section 106 Consultation

The NHPA{ XE "National Historic Preservation Act (NHPA)" } Section 106 comment process began in conjunction with the NEPA{ XE "National Environmental Policy Act (NEPA)" } process for the EIS. At the public scoping meetings, the BLM had a table set up for presenting and discussing the Section 106 process and for soliciting comments. The agency received very few comments during these meetings pertinent to cultural resources, as defined by the NHPA (e.g., potential grazing impacts on Native American sites). However, some comments that were received suggested that the BLM did not recognize the importance of the ranching history and livestock grazing in the planning area or its importance to the continuation of a certain way of life and the economy.

The BLM invited all those who provided comments on cultural resource issues to become consulting parties. The agency sent letters to 172 parties on the mailing list and sent e-mails to 649 others.

The following entities responded with a request to become consulting parties:

State Agencies or Entities, Local Governments, and Tribes

- Advisory Council on Historic Preservation
- Arizona State Historic Preservation Office{ XE "State Historic Preservation Office (SHPO)" }
- Arizona State Lands Department
- Canyonlands Conservation District
- City of Panguitch
- City of Tropic
- Garfield County
- Hopi Tribe
- Kaibab Band of Paiutes
- Kane County
- Utah SITLA

- Utah Public Lands Policy Coordination Office
- Utah State Historic Preservation Office{ XE "State Historic Preservation Office (SHPO)" }
- Utah State University Extension

Nongovernmental Organizations

- Church of Jesus Christ Latter Day Saints, Church History Department
- Grand Canyon Trust
- Grand Staircase-Escalante Partners
- Great Old Broads for Wilderness
- National Parks Conservation Association
- The Wilderness Society BLM Action Center
- Western Watersheds Project
- Yellowstone to Uintas Connection

In addition to those listed above, a number of permittees and other concerned citizens responded requesting to be consulting parties.

Also invited, but not accepting the invitation, were the Hualapai Tribe, Navajo Nation, Paiute Indian Tribes of Utah, Pueblo of Zuni, San Juan Southern Paiute Tribe, Ute Mountain Ute, and Ute Tribe of the Uintah and Ouray Reservation.

In addition to the scoping meetings, the BLM hosted Section 106 consultation meetings with the consulting parties, cooperating agencies, and interested members of the public (see **Table 5-5**, Consulting Party Meetings). These meetings were to discuss the background of the NHPA{ XE "National Historic Preservation Act (NHPA)" }, Section 106 legal responsibilities, potential impacts of the undertaking on cultural resources, background on the cultural resources in GSENM, and the BLM's efforts to identify the current condition of cultural resources across the area of potential effect. Also included were discussions on a proposed grazing history of the area and a request to submit known archaeological and historical sites and information related to grazing history. Information and input received during these meetings was used to inform the development of the programmatic agreement (see **Appendix E**). All consulting party meetings were concluded with a question-and-answer session.

Table 5-5
Consulting Party Meetings

Meeting Invitees	Date	Location
Kaibab Band of Paiutes	December 19, 2014	Kaibab Band of Paiutes Reservation
All consulting parties and cooperating agencies	January 22, 2016	Kanab, Utah
Kaibab Band of Paiutes	February 29, 2016	Kaibab Band of Paiutes Reservation
All consulting parties and cooperating agencies	March 15, 2016	Cannonville, Utah

Table 5-5
Consulting Party Meetings

Meeting Invitees	Date	Location
Hopi Tribe	March 23, 2016	Hopi Reservation
All consulting parties and cooperating agencies	June 8, 2016	Cannonville, Utah

As an outgrowth of the MMP{ XE "Monument Management Plan, Grand Staircase-Escalante National Monument (MMP 2000)" }-A/EIS and consulting party meetings, GSENM has begun the production of a Kane and Garfield Counties Grazing History. This informational document is scheduled for release in late 2017 or early 2018.

5.4 Coordination

5.4.1 Cooperating Agencies

GSENM invited eligible federal agencies, state and local governments and federally recognized Native American tribes to participate as cooperating agencies during MMP{ XE "Monument Management Plan, Grand Staircase-Escalante National Monument (MMP 2000)" }-A/EIS development. These agencies were invited to participate because they have jurisdiction by law or special expertise. More specifically, cooperating agencies "work with the BLM, sharing knowledge and resources, to achieve desired outcomes for public lands and communities within statutory and regulatory frameworks" (BLM Land Use Planning Handbook H-1601-1 [BLM 2005]).

On May 13, 2013, the BLM wrote to seven local, state, federal, and tribal representatives, inviting them to participate as cooperating agencies for the MMP{ XE "Monument Management Plan, Grand Staircase-Escalante National Monument (MMP 2000)" }-A/EIS. In June and July 2013, four agencies agreed to participate in the MMP-A/EIS process as designated cooperating agencies (**Table 5-6**, Cooperating Agencies). The US Department of Agriculture, Natural Resources Conservation Service, was later added as a fifth cooperating agency in September 2014. The NPS specifically has jurisdiction by law and will be making its own separate decision for lands within Glen Canyon based on this EIS.

Table 5-6
Cooperating Agencies

Agency/Tribe Invited to Be a Cooperating Agency	Accepted?
US Department of the Interior, National Park Service – Glen Canyon National Recreation Area	Yes
US Department of the Interior, Fish and Wildlife Service	No
US Department of Agriculture, Natural Resources Conservation Service	Yes
State of Utah	Yes
Garfield County, Utah	Yes
Kane County, Utah	Yes
Kaibab Band of Paiute Indians	No
Paiute Indian Tribe of Utah	No

As directed by 43 CFR 1610.4, the BLM has collaborated with the cooperating agencies during data inventory and information collection, formulation of alternatives, analysis of impacts of alternatives, and input on selection of the preferred alternative. In July, 2014, the BLM held an alternatives theme workshop in Kanab, Utah, with the cooperating agencies. During the workshop, the cooperating agencies helped the BLM draft themes for a range of alternatives, including a discussion of alternatives dismissed from detailed analysis. The BLM then used the themes of the alternatives to craft the detailed descriptions of the alternatives.

The decision to select a preferred alternative remains the exclusive responsibility of the BLM (43 CFR 1610.4-7) or the NPS for their respective administrative jurisdictions. Throughout the planning process, the BLM has invited the cooperating agencies to provide information on various planning topics and other county- or state-level information within the agencies' area of special expertise. Cooperating agencies were also encouraged to attend the scoping open houses and provide comments during the scoping period. One representative from Glen Canyon attended the meetings in Kanab and Escalante to answer questions from the public. Representatives from both Garfield and Kane Counties also attended the scoping meeting in their respective counties.

The BLM received scoping comments from the State of Utah and Garfield and Kane Counties. Since November 6, 2013 to date, the BLM has conducted 28 meetings with some or all of the cooperating agencies regarding various planning issues{ XE "Planning Issues" }. *[EMPSi: Update number to reflect the number of meetings held at the Draft MMP{ XE* "Monument Management Plan, Grand Staircase-Escalante National Monument (MMP 2000)" *}-A/EIS publication.]*

The BLM sought further input from all cooperating agencies by providing multiple opportunities to review and provide comments on draft planning documents (i.e., scoping report, Analysis of the Management Situation, alternatives, impact analysis methodology, preliminary draft chapters of the Draft MMP{ XE "Monument Management Plan, Grand Staircase-Escalante National Monument (MMP 2000)" }-A/EIS. Throughout the planning process, the cooperating agencies have provided input to the BLM via verbal and/or written formats that helped develop this MMP-A/EIS. Through these various avenues, the cooperating agencies have been engaged throughout the planning process, including during alternatives development, and will continue to be engaged in the final EIS.

5.4.2 GSENM Advisory Committee

The GSENM Advisory Committee was established by the Secretary of the Interior to advise BLM GSENM managers on science issues and the achievement of MMP{ XE "Monument Management Plan, Grand Staircase-Escalante National Monument (MMP 2000)" } objectives. It is composed of 15 members: seven scientists and eight public members, permittees, outfitters, tribal and state government representatives, and elected officials representing different areas of expertise. The BLM has provided MMP-A/EIS planning updates to the GSENM Advisory Committee since 2011.

5.5 Consistency with Related Plans

The BLM's planning regulations require that RMPs be "consistent with officially approved or adopted resource-related plans, and the policies and programs contained therein, of other federal agencies, state and local governments, and Indian tribes, so long as the guidance and

RMPs also are consistent with the purposes, policies, and programs of federal laws and regulations applicable to public lands" (43 CFR 1610.3-2(a)). Chapter 1, **Section 1.7**, Related Plans, discusses the other plans relevant to the MMP{ XE "Monument Management Plan, Grand Staircase-Escalante National Monument (MMP 2000)" }-A that have been considered and reviewed during this planning process.

This section identifies known inconsistencies between the alternatives and federal, state, local and tribal plans and policies, using comments provide during the public review period of the preliminary draft alternatives and cooperating agency evaluation of "officially approved or adopted resource related plans" (43 CFR 1610.3-2 (a) and (b)). In instances where state and local plans, policies, or programs may differ, the BLM has disclosed both instances of inconsistency, but would defer to those of the state, per 43 CFR 1610.302(d).

To assist in the consistency review, the BLM requested the state and county cooperating agencies review the draft alternatives at two stages—the preliminary draft alternatives and the range of alternatives associated with the Draft MMP{ XE "Monument Management Plan, Grand Staircase-Escalante National Monument (MMP 2000)" }-A/EIS—and to identify potential inconsistencies between the alternatives and each agency's applicable plans. This allows the state and cooperating agencies to use their special expertise regarding the familiarity with their own state or local plans. The BLM also requested the general public and tribes' review of the preliminary draft alternatives to identify potential inconsistencies between the alternatives and applicable agency or tribal plans.

The cooperating agencies performed their consistency reviews at varying levels of detail. During cooperating agency and public review of the preliminary draft alternatives (see **Section 5.2.8**, Public Involvement in the Preliminary Draft Alternatives), nine discrete comments (1 percent of all comments) were received from the State and Garfield and Kane Counties regarding consistency with state or local plans and policies. Appendix B, Section 16, of the GSENM Livestock Grazing Plan Amendment EIS Preliminary Alternatives Comment Report (BLM 2016) includes these comments. During cooperating agency review of the MMP{ XE "Monument Management Plan, Grand Staircase-Escalante National Monument (MMP 2000)" }-A/EIS before publication, ## comments were received from the State and ## counties about consistency with state or local plans and policies. *[BLM: This information will be completed after the cooperators review the Administrative Draft MMP-A/EIS.]* The consistency evaluations are summarized below. As the planning process continues from draft to final EIS, additional consistency evaluations will help identify what decisions in the range of alternatives will be included the Proposed MMP-A/Final EIS. An additional consistency evaluation will be disclosed in the Final EIS.

The BLM is aware that there are specific state laws and local plans relevant to aspects of public land management that are discrete from, and independent of, federal law. However, the BLM is bound by federal law. Consequently, there may be inconsistencies that cannot be reconciled. The FLPMA{ XE "Federal Land Policy and Management Act (FLPMA)" } and its implementing regulations require that BLM land use plans be consistent with officially approved state and local plans to the extent that they are consistent with the purposes, policies, and programs of federal laws and regulations applicable to public lands. Where officially approved state and local plans or policies or programs conflict with the purposes, policies, and programs of federal law applicable

to public lands, there will be an inconsistency that cannot be resolved. With respect to officially approved state and local policies and programs (as opposed to plans), this consistency provision only applies to the maximum extent practical. While county and federal planning processes, under the FLPMA, are required to be as integrated and consistent as practical, the federal agency planning process is not bound by state and county plans, policies, or programs.

As noted above, the BLM will identify any potential conflicts between the Proposed MMP{ XE "Monument Management Plan, Grand Staircase-Escalante National Monument (MMP 2000)" }-A in the Final EIS so that the state, local, and tribal governments have a complete understanding of the impacts of the MMP-A on their management options. A consistency review of the Proposed MMP-A with the applicable state, county, and tribal plans will be included in the Final EIS. In addition, the relevant goals, objectives, or policies of a county are often equivalent to an activity or implementation-level decision and not an MMP-level decision. Specific county goals will continue to be reviewed and considered in subsequent BLM activity or implementation-level decisions.

The following subheadings outline the planning consistency of the range of alternatives with approved management plans of State and local governments within which BLM-administered lands associated with this EIS are located. It is important to note that the identification of consistency or inconsistency at this point in the planning process does not eliminate the opportunity to reevaluate consistency during the timeframes formally identified for consistency review in regulation.

5.5.1 The following subheadings group the identification of known inconsistencies alternatives with approved management plans of State and local administered lands associated with this EIS are located. It is important to identification of inconsistencies at this point in the planning process notifies local governments of known inconsistencies. The absence of some either consistent management or an inconsistency that the agency has not per regulatory requirements. The formal governors' consistency review MMP{ XE "Monument Management Plan, Grand Staircase-Escalante 2000)" }-A/Final EIS (see Section 5.2.10, Other Outreach

In August, 2014, the BLM held a biological soil crust{ XE "Biological Soil Crust" } forum at the Kanab public library and opened it to the public. The forum included panel discussion from members of the scientific community who are recognized as experts on the ecosystem function of biological soil crust. While the forum was educational in nature, it also informed the BLM on the importance of biological soil crust and the BLM incorporated aspects of protection of biological soil crusts into the alternatives.

In August, 2015, the BLM also held a rangeland treatments forum. This forum was primarily focused on informing the public and other interested parties of the types of range improvements{ XE "Range Improvement" } that the BLM engages in and what they look like on the landscape. One day of the forum was held in Kanab at the BLM and the second day of the forum included a field visit to look at what the various treatments look like on the landscape.

Future Public Involvement Opportunities) will allow agencies the legal opportunity to identify additional information, as applicable.

Consistency requirements are only applicable on BLM-administered lands. Consistency with state and local plans where there are no BLM-administered lands in the planning area are not addressed. In these instances, consistency, as described above, is not required. However, cooperation regarding the agencies' applicable special expertise or jurisdiction by law has occurred.

The BLM Authorized Officer will continue to collaborate with federal agencies and state and local governments with applicable BLM-administered lands, as well as Indian tribes, on preparation of the Proposed MMP**{** XE "Monument Management Plan, Grand Staircase-Escalante National Monument (MMP 2000)" **}**-A and on pursuing consistency with other plans and will move toward integration of such plans to the extent that they are consistent with federal laws, regulations, and policy directives.

5.5.2 Consistency with Tribal Plans, Policies, and Programs

No resource-related plans, policies, or programs were provided by the tribes or located by the BLM, therefore no consistency evaluation was conducted. Additional coordination with the tribes will be attempted during preparation of the Final EIS to determine consistency.

5.5.3 Consistency with State Plans, Policies, and Programs

In 2013, Utah Code[1] established the Escalante Region Grazing Zone in Garfield and Kane Counties which includes GSENM. The code states that livestock grazing in the area has contributed to the history, customs, culture, economy, welfare, and other values for more than 100 years and that there is potential to expand livestock grazing.

In Utah Code 63J-8-105.8-4, the priorities for managing lands within the grazing zone are the "preservation, restoration, and enhancement of watershed and rangeland health**{** XE "Rangeland Health" **}** to sustain and expand forage production for both livestock grazing and wildlife habitat, and the restoration and development of historic, existing, and future livestock grazing and wildlife habitat resources in order to provide protection for the resources, objects, customs, culture, and values identified above." The code calls on federal agencies that manage lands within the Escalante Region Grazing Zone to work with the State and Counties to implement management decisions that are consistent with the code to the maximum extent allowable under federal law. This includes enhancing and developing all existing and new grazing resources and refraining from decisions that undermine, restrict, or diminish the goals, purposes, and policies for the zone.

According to Garfield County, Kane County, and the State of Utah, provisions throughout each of the alternatives are inconsistent with State law. In Alternative B, reducing grazing numbers from those that existed before GSENM was designated in 1996 is inconsistent with State law. Under Alternative C, reducing grazing and providing large ungrazed referenced areas is inconsistent with state law. The State of Utah and counties agreed that Alternative D is the most consistent with state law.

[1] Title 63J, Chapter 8, State of Utah Resource Management Plan for Federal Lands, Section 105.8, Utah Grazing Agricultural Commodity Zones

5.5.4 Consistency with County Plans, Policies, and Programs

In general, at the preliminary draft alternatives stage, the responding counties noted that Alternatives B, C, and D were not consistent with their county plans and policies, though they identified Alternative D as the alternative with the fewest inconsistencies.

Coconino County, Arizona

The Coconino County Comprehensive Plan was adopted in 2003 and is currently being revised. It addresses growth, conservation, and development and includes a section on preserving ranches and ranchlands in the county. Additional coordination with the county will be attempted during preparation of the Final EIS to determine consistency.

Garfield County, Utah

The Garfield County General Management Plan{ XE "General Management Plan, Glen Canyon (GMP 1979)" } (adopted November 8, 2007) establishes criteria, policies, and requirements to be met in the federal land use planning process. It documents baseline conditions for analysis and states that, where quantified data is not available, professional judgment must defer to policies and objectives outlined in the Garfield County Resource Management Plan. A 2013 amendment addresses the cultural and historic value of grazing and places the Escalante Historic/Cultural Grazing Region on the County Register of Cultural and Historic Resources.

According to Garfield County, Alternative D appeared the most compatible with Garfield County's plans, programs, and policies and local ordinances. Provisions throughout each of the alternatives are inconsistent with local plans, policies, and ordinances. Existing range improvements{ XE "Range Improvement" } and livestock grazing itself are cultural resources identified in Garfield County's protection of cultural resource ordinance. Providing large ungrazed referenced areas in Alternative C is inconsistent with Garfield County's plans, program, and policy. Garfield County also stated that Alternative D is inconsistent with the county's plan, policy, or program, and that failure to consider a maximum sustainable grazing alternative is inconsistent with county plans, policies, programs, and ordinances.

Kane County, Utah

The Kane County General Plan (adopted June 22, 1998; last amended December 19, 2016) addresses growth and development and partnerships with federal agencies in Kane County. It was amended in August 2014 to adopt the Escalante Region Multiple Use/Multiple Functions Grazing Zone in response to the public's concerns on grazing public lands versus on private lands and agricultural pursuits. The grazing zone emphasizes the social, economic, historic, and cultural importance of grazing to Kane County and its residents.

Section 2 of the Kane County Resource Management Plan (adopted June 1998; last amended December 19, 2016), titled Region #2 – Grand Staircase, describes its intentions for the GSENM portion of the decision area as it relates to livestock grazing. In it, Kane County interprets Presidential Proclamation 6920 establishing GSENM as identifying livestock grazing as a monument object. The resource management plan lays out Kane County's desire to achieve the following:

- Treat large acreages of GSENM to promote resilient watersheds and healthy landscapes, for a balanced ecosystem

- Increase the carrying capacity in GSENM through active adaptive management and vegetation treatments{ XE "Vegetation Treatment" }
- Treat encroaching pinyon, juniper, and other woody species to promote and support resilient watersheds, rangeland, and wildlife habitat
- Remove and control invasive nonnative species and reestablish native grasses
- Implement range improvements{ XE "Range Improvement" }

Kane County also describes livestock grazing management in its Land Use Ordinances, Title 9, Chapter 27, Escalante Region Multiple Use/Multiple Functions Grazing Zone. The ordinance states that the purpose of providing a multiple use/multiple function zone are to establish areas that are open and generally undeveloped lands, where human habitation would be limited. The zone is designed to enhance and protect land and associated open space resources. It is established to encourage the use of land, where appropriate, for livestock grazing, wildlife habitat, and recreation, among other uses. This zone is established to protect all valid private property rights and the continued use and full access to these rights. It is intended to promote the health, safety, convenience, order, prosperity, and general welfare and economy of the inhabitants of Kane County, tourists, and future generations.

Kane County stated that the adaptive management of grazing seasons in Alternatives C, D, and E is compatible with the Kane County RMP.

The inconsistencies identified by Kane County include inconsistencies between county codes and discontinuing livestock grazing in Alternative B. Kane County stated that, in Alternative B, reducing grazing numbers from those that existed before GSENM was designated in 1996 is inconsistent with county land use plans and the conservation district county resource assessment. Kane County also indicated that, in Alternative C, requiring riders to be present five of every seven days throughout the season of use where allotments are not meeting or moving toward objectives is inconsistent with the Kane County RMP.

5.6 List of Preparers

This Draft MMP{ XE "Monument Management Plan, Grand Staircase-Escalante National Monument (MMP 2000)" }-A/EIS was prepared by an interdisciplinary team of resource specialists from the BLM and Environmental Management and Planning Solutions, Inc. (**Table 5-7**, MMP-{ XE "Monument Management Plan, Grand Staircase-Escalante National Monument (MMP 2000)" }A/EIS Preparers). In addition, staff from numerous other federal, state, and local agencies, and nonprofit organizations contributed to developing the Draft MMP-A/EIS.

Table 5-7
MMP-{ XE "Monument Management Plan, Grand Staircase-Escalante National Monument (MMP 2000)" }A/EIS Preparers

Name	Role/Responsibility
	BLM GSENM
Matt Betenson	Associate Monument Manager and MMP-{ XE "Monument Management Plan, Grand Staircase-Escalante National Monument (MMP 2000)" }A Lead
Allysia Angus	Visual Resources
Jabe Beal	Recreation, Lands with Wilderness Characteristics, Wild and Scenic Rivers, BLM Wilderness Study Areas and NPS Recommended Wilderness
Ken Bradshaw	Soil Resources, Water Resources, Air Quality
Katherine Farrell*	MMP-{ XE "Monument Management Plan, Grand Staircase-Escalante National Monument (MMP 2000)" }A Lead
Amber Hughes	Vegetation
Eric Matranga*	GIS
Cameron McQuivey	Fish and Wildlife, Special Status Species
Kevin Miller*	Soil Resources, Water Resources, Air Quality
Cindy Staszak	Monument Manager
Sean Stewart	Livestock Grazing
Julie Suhr Pierce	Socioeconomics, Environmental Justice
Alan Titus	Paleontological Resources
Matt Zweifel	Cultural Resources, Tribal Interests
EMPSi: Environmental Management and Planning Solutions, Inc.	
Kate Krebs	Project Manager, Livestock Grazing, Visual Resources, Wild and Scenic Rivers
Blake Busse	Deputy Project Manager, Lands with Wilderness Characteristics, Wild and Scenic Rivers
Angie Adams	Chapters 1 and 5, Quality Assurance
Amy Cordle	Air Quality
Zoe Ghali	Environmental Justice
Peter Gower	Recreation, BLM Wilderness Study Areas and NPS Recommended Wilderness, Lands with Wilderness Characteristics
Derek Holmgren	Soil Resources, Water Resources
Jenna Jonker	GIS
Molly McCarter	Visual Resources
Nicholas Parker	Cultural Resources, Tribal Interests, Paleontological Resources
Holly Prohaska	Livestock Grazing
Morgan Trieger	Fish and Wildlife, Special Status Species

*Former employee

5.7 REFERENCES

BLM (United States Department of the Interior, Bureau of Land Management). 2004. Manual 8120: Tribal Consultation under Cultural Resources. Rel. 8-74, December 3, 2004. BLM, Washington, D.C.

_____. 2005. Handbook H-1601-1: Land Use Planning Handbook. Rel. 1-1693, March 11, 2005. BLM, Washington, DC.

_____. 2008. Handbook H-1790-1: NEPA{ XE "National Environmental Policy Act (NEPA)" } Handbook. Rel. 1-1710, January 30, 2008. BLM, Washington, DC.

_____. 2014. Grand Staircase–Escalante National Monument Livestock Grazing Plan Amendment EIS—Scoping{ XE "Scoping" } Report. BLM, Grand Staircase–Escalante National Monument, Kanab, UT. May 2014.

_____. 2016. Grand Staircase–Escalante National Monument Livestock Grazing Plan Amendment EIS—Preliminary Alternatives Comment Report. BLM, Grand Staircase–Escalante National Monument, Kanab, Utah. June 2016.

Appendix C

Cultural Resources Management Protocol

APPENDIX C
CULTURAL RESOURCES MANAGEMENT PROTOCOL

The management of cultural resources on federal lands is dictated, to a large part, by federal laws and regulations. Although there are many addressing cultural resource concerns, the most applicable laws and regulations for both the BLM and the NPS are the following:

- National Environmental Policy Act
- National Historic Preservation Act (54 USC, Section 300101 et seq.)
- Antiquities Act
- Historic Sites Act
- Management of Museum Properties Act
- American Indian Religious Freedom Act
- Religious Freedom Restoration Act
- Archaeological Resources Protection Act
- Native American Graves Protection and Repatriation Act
- Code of Federal Regulations (CFR) 36, Part 800
- 43 CFR, Part 8100

The applicable law and regulation for the BLM alone is the Federal Lands Policy Management Act. Applicable laws and regulations for the NPS alone are the Organic Act and the Redwoods Act. See also **Chapter 1** for a discussion of cultural resources.

Measures outlined or proposed here are presented as common to all action alternatives, except for Alternative B, which would eliminate livestock grazing. The measures are common to all because there is little leeway in how these resources are managed and protected.

Cultural resources are nonrenewable; that is, any loss or degradation of cultural resources is permanent. Archaeological and historic sites that are eligible for listing on or that are included on the National Register of Historic Places (NRHP) are termed historic properties and are afforded certain legal protections. Sites determined as ineligible for listing on the NRHP (not eligible under NHPA Section 106) may still be afforded some protections under ARPA and FLPMA. It is important that there is no net loss of scientific information potential or integrity for historic properties and that they should be managed to prevent or minimize adverse impacts on integrity or any of the qualities that are character defining. Preservation and protection are the primary goals of any federal cultural resource program.

Chapter 3 presents the background information on cultural resources, properties, conditions, and trends in the planning area. A brief description of the types of properties found in the planning area and the various forms of impacts that could affect these sites is included in this appendix. A description of the resource types felt to be most susceptible to grazing-related adverse effects is included below. Also included in this section is a description of the process by which cultural resources were analyzed for this EIS, the criteria by which determinations of effect will be made, and a discussion of potential mitigation options for sites being adversely affected by grazing-related activities.

SITES AND ADVERSE EFFECTS

Cultural resource concerns regarding grazing and related adverse effects focus on site type and the potential for effects caused by livestock. Site types felt to be most susceptible to grazing-related activities are as follows:

1. Rock shelters, where cattle tend to congregate for shelter both in hot and cool seasons—These locations often contain complex sites with a variety of features that can include delicate and perishable materials not found in open settings, and very complicated natural and cultural sedimentary stratigraphy. Sites in these locations can suffer from the immediate and cumulative physical effects of the livestock, increased erosion, trampling and sedimentary churning, and chemical changes in the soils due to the deposition of large amounts of livestock dung and urine. Grazing-related adverse effects in rock shelters near the study area were noted as early as 1919 (Judd 1926:118). Although rare in rock shelters, range improvement or stock control projects can also adversely impact sheltered sites (see 3, below).

2. Sites with standing architecture, including historic and prehistoric sites, and sites with exposed architectural features—These sites may have architectural features that can suffer from livestock impacts. Standing walls at both historic and prehistoric sites can be attractive to cattle as rubbing areas, resulting in immediate and significant adverse impacts on those structures. Even sites with only a few courses of intact masonry would be included in this category, because any adverse effects would be considered unacceptable levels of damage.

3. Open sites in sensitive locations, such as in erosive soils, or in areas that tend to concentrate the presence of livestock (such as watering or feed locations, corrals, trails, or salt licks), and those sites with discreet features such as hearths, slab features, soil staining, middens, and other features that are susceptible to trampling from livestock—

Sites in erosive sediments suffer from natural weathering effects that are exacerbated by trampling and vegetation removal by livestock. Features such as middens, hearths, and fire-cracked rock, lithic debitage, and artifact concentrations are easily disturbed by trampling; once disturbed, they lose integrity and scientific value. In certain contexts, cumulative effects due to disturbance and erosion can quickly and irreversibly impact these features, especially in sensitive soils and on slopes. Buried slab features, such as slab-lined hearths, storage features, and pit houses may at first seem impervious to cattle impacts; however, observation has shown that this is not always the case, especially with softer sandstones. Hard sandstone slabs may help to enclose and protect some features, but softer sandstones may weather quickly. As the upper margins of soft sandstone slabs are exposed through erosion and weathering, these slabs can be quickly broken down by exposure to the elements and trampling by livestock. Without the slabs to help protect and define the features, they can be rapidly lost to additional exposure, erosion, and trampling.

This category may exclude sites, based on their lack of potential for additional adverse effects. For example, a lithic scatter found on sandy sediments or slopes open to cattle trailing and increased erosion would be included in this category, while a lithic scatter on stable, gravely sediments with little depth potential, light grazing use, and not prone to increased erosion might not be included.

Sites in this open setting category are also susceptible to any ground-disturbing projects, such as mechanical treatments for vegetation manipulation using heavy equipment (such as fuels treatment, decadent sagebrush replacement, stand thinning) and the creation of or maintenance of seedings (such as chaining, dozer "pushes," bullhog thinning, and harrowing), trenching for water lines, and corral and access road construction. Even sheltered sites (see above) and rock art sites (see below) in certain settings may be susceptible to indirect effects from nearby heavy equipment use, such as road dust deposition on rock art panels and vibration, resulting in damage to rock faces and overhangs.

4. Rock art sites accessible to livestock, including historic inscriptions, and especially those sites in areas where cattle are likely to congregate—Although vandalism is by far the most important factor concerning adverse impacts on rock art, livestock can adversely impact these sites as well. Instances of both petroglyphs and pictographs suffering from livestock rubbing have been noted in the decision area, and cases of dung splattering on rock art panels have been documented in the decision area and noted in nearby areas.

All readily accessible sites can be subject to various degrees of grazing-related influences, but the above sites are considered to be more easily damaged than most other site types. These conclusions are based on field observations, reviews of literature (see for example Geib et al. 2001, Geib 1989, and Cinnamon 1986), and conversations with other area archaeologists. While site type is important with regard to adverse effects, site location is also a factor. Observation has shown that sites in the immediate vicinity of range improvements that focus livestock-related activity, including seedings, will suffer more grazing-related effects than those sites more removed from range improvements and natural or developed water sources.

FINDINGS OF EFFECT

Findings of effect represent a measured analysis of the state of an archaeological or historic site in relation to the agents in question or a proposed activity (in this case, grazing- and livestock-related activities). Identification of factors leading to any finding of effect will need to be based on professional observations, data collection, and judicious application of national guidance. Direction at 36 CFR, Subpart 800.5, provides for adverse effect and no adverse effect. Also considered in this appendix are two additional subcategories, a finding of no effect and a finding of beneficial effect. These are not part of 36 CFR, Subpart 800.5, but have been added to this analysis to better describe potential effects and management options. They are described under *Findings of No Adverse Effect*, below, and would be consistent with "no historic properties affected" under 36 CFR, Subpart 800.4(d)(1).

A finding of adverse effect means that the site is being affected or will be adversely affected by the agents in question, as defined in 36 CFR, Subpart 800.5(a)(1):

> An adverse effect is found when an undertaking may alter, directly or indirectly, any of the characteristics of a historic property that qualify the property for inclusion in the National Register in a manner that would diminish the integrity of the property's location, design, setting, materials, workmanship, feeling, or association.

The BLM and NPS will make findings of effect for previously recorded sites, based on existing data, at least until such time as the agencies can revisit the sites and prepare an updated site form (if necessary). The land managing agencies will also apply findings for cultural resource sites identified in the future. Future data will come from research-driven inventories and from NHPA Section 106 inventories related to implementation actions, such as grazing permit renewals and rangeland improvements, in addition to an active, ongoing monitoring and management program. Thresholds for making findings of effect follow the description of each category. Findings for all sites, whether previously documented or newly discovered, are made on an individual, case-by-case basis.

Finding of No Adverse Effect

After more than 100 years of grazing, it would be reasonable to assume that any livestock-accessible site has been grazed over and affected to some degree, whether those effects were adverse or otherwise. However, under specific conditions on some sites, any adverse effects may have reached their most detrimental levels decades before. Numbers of livestock were significantly higher prior to 1935 than they are now, suggesting that grazing-related pressures to sites were probably greater at that time. It also suggests that they have probably somewhat diminished since that time. This trend has been noted by other archaeologists (see, for example, Popelish 2001).

At stable sites, not prone to erosion (as noted above), additional adverse effects might not be expected, as modern cattle are probably only affecting the upper few centimeters of site sediments that have been previously adversely affected. Although such a site may have suffered adverse effects in the past, as outlined above, the basic question still revolves around site integrity. If the site is losing integrity, affecting its eligibility under the relevant National Register criteria, it will not fit into the no adverse effect category. If, on the other hand, the site is not

suffering adverse effects in addition to those already inflicted by earlier activities, then a determination of no adverse effect may be applicable.

In some cases, the architectural features of a site, either through natural forces or through previous livestock use or other impacts, have been adversely impacted to the point that additional use by livestock will not further damage them. The structural component of a pueblo site on stable sediments, whose walls have been reduced to linear rubble mounds, will probably not suffer greatly from additional use by cattle. This is because the cattle will tend to walk around loose rock rather than over it.

Thresholds—Sites with a finding of no adverse effect may show indications of past or ongoing use by livestock but will show no indications that ongoing livestock use is contributing to adverse effects. Care must be exercised when assigning sites to this category, as it may be difficult to determine if current grazing use is not contributing to ongoing adverse effects.

An example of the confusing nature of this analysis was noted by Nielson (1991:493), where he observed that sherds (and presumably other artifacts) exposed to hoof action will eventually reach a size class that is no longer affected by trampling; however, this size class will differ, based on such variables as artifact and material type, sediment characteristics, and weight and contact surface of the trampling agent. In this case the original trampling would indeed be seen as an adverse impact. However, once the sherds are no longer affected by trampling, additional grazing on that site will have no additional adverse effect on those sherds. Nevertheless, continued grazing may well be adversely affecting other aspects or components of the site. The no adverse effect category should be used with caution and reserved for sites where it is demonstrated through careful analysis that current grazing practices are not adversely affecting any of the multiple site components or its potential eligibility for listing on the National Register.

Two additional subcategories have been added to this discussion of no adverse effect to help clarify this discussion. While the no effect and beneficial effect categories are not included in 36 CFR, Part 800, regulations, they would be included in the larger finding of no adverse effect. These are presented here for discussion and are described below.

No Effect—This class of sites would primarily include those sites that are inaccessible to livestock, such as certain rock art panels, those sites on isolated land forms, and those found on very steep or cliff-side or otherwise inaccessible locations. As most sites are accessible to livestock, this site class would be a small percentage of the whole.

Thresholds—Sites in this category show no evidence of, and no potential for, disturbance by livestock or grazing-related activities.

Beneficial Effect—A beneficial effect is one that will have a positive effect, usually on the site itself; however, it can also include actions that will further interpretive and educational aspects of cultural resources and cultural resource management. An example of beneficial effects is the use of historic trails and trail systems. In the EIS area, there are numerous historic trails associated with the early ranching and grazing. Most of these trails have not been used in decades and are fast fading from the ground and the collective memory of local inhabitants. Such trails are a class of linear cultural resource and often are considered eligible for listing on the

National Register of Historic Places. Allowing continued use and, to a practical extent, promoting the use and maintenance of these trails is a means by which these types of sites can be preserved, while allowing for good public education and interpretation possibilities. Similar arguments could be made for certain historic roads or historic structures (such as line cabins), where maintenance under 36 CFR, Part 67 (Secretary of the Interior's Standards for Rehabilitation) and appropriate use would have a beneficial effect on a structure that might otherwise fall into disrepair and neglect.

Finding of Adverse Effect

These findings are based on observations regarding the site type, condition, ongoing impacts, use by livestock, and compounding factors, such as increased erosion, vandalism, and visitation. Mitigation for these sites can include a variety of approaches, as outlined in the following sections.

Thresholds—Factors of site condition and ongoing effects will need to be considered prior to a finding of adverse effect. Cultural resource specialists should focus on key points regarding site integrity and the National Register criteria. Because cultural resource sites are nonrenewable resources, if potential adverse effects are suspected but not conclusively identified, it may be prudent to assume these effects are indeed ongoing and to proceed accordingly until such adverse effects are positively verified or refuted.

Following are suggestions of thresholds for a finding of adverse effect:

- Indications of actively ongoing erosion at a historic property that is caused by, or exacerbated by, livestock use of the site area
- Indications of direct, indirect, or cumulative adverse effects due to livestock, where it is apparent that the livestock are impacting portions of the historic property or features of the property that were not previously adversely impacted by earlier use of the site area by livestock
- Indications of direct or indirect adverse effects by livestock, where it is observed through scientific investigation that the levels of adverse effect are beyond those previously suffered by the site (or portion of the site) prior to NEPA and NHPA requirements, and intact areas are now losing integrity and research potential, or where adverse effects are impinging on any of the qualities that make a site eligible for listing on the National Register
- Indications of adverse effects caused by grazing-related activities, such as range improvements, range management practices, livestock congregation, and herding/driving activities

TOOLS FOR SITE PROTECTION AND MANAGEMENT

Land managers must "… seek ways to avoid, minimize, or mitigate … adverse effects," as outlined at 36 CFR, Subpart 800.6(b).

Following are detailed explanations of the various protection measures for cultural resources in relation to this EIS. Which option or options are chosen will depend on several factors,

including site type, characteristics that relate to its eligibility for listing on the National Register, location, access and use for and by livestock, nearby rangeland improvements, soil type, site condition, results of any Native American or other consultations, and likelihood for continued grazing-related adverse effects. The tools are presented below in two primary sections, Non-Cultural Tools and Cultural Tools. Each tool is examined and detailed in regard to grazing and grazing-related adverse effects. These tools may be used singly or in combination to meet the required objectives.

NON-CULTURAL TOOLS FOR SITE PROTECTION

Avoidance

The simplest and most effective way to protect a historic property is to avoid any adverse effects. While this can be relatively easy in some cases (such as moving a proposed corral location to avoid a historic property), it becomes more difficult with livestock that are relatively free to move on their own. This avoidance option is best used with fixed objects, such as a proposed corral, road, water improvement, or certain other range improvements. Many of the following tools are more applicable to livestock and can work both in the minimization and mitigation aspects.

Access Restriction

Restricting livestock access, as considered here, generally refers to restrictions on a site-by-site basis. In some settings, such as a rock shelter or overhang, restrictions may be accomplished easily with barriers. Where possible, brush barriers could be used. They would have the advantages of appearing more natural, would not call attention to the site, and would not generally require much in the way of tools or artificial materials. Where such natural barriers could not be used, traditional fencing or other restrictive options may be necessary.

Closures of small, site-specific locations would not cause any substantial loss of land base or AUMs (animal unit months, a measure of livestock stocking rates) to the permittees. Any closures of areas large enough to reduce AUMs would require a land use plan amendment and consultation with the permittees and other interested parties (see also *Area Closures*, below).

Changes in Season of Use

It is at first difficult to see how changes in season of use could be used as mitigation for a cultural resource site, but this tool should be considered as a possibility. Livestock tend to congregate in sheltered areas, such as alcoves, overhangs, and rock shelters. Part of this behavioral pattern is in response to weather conditions; in the summer, livestock will “shade up” in shelters; in the winter they will move to these shelters for protection from wind, rain, and snow. In either weather extreme, livestock will seek the sheltered areas. Vegetation has a stabilizing effect on sediments and soils. A change in season of use that reduces adverse effects on vegetation would also increase site stability by lessening erosion.

In wet weather, such as the monsoon season, there is a more abundant water supply in areas that might not usually have available water, such as natural tanks in slick rock areas. Under these conditions livestock may tend to wander farther from their traditional water source than they would under normal conditions, entering areas and impacting sites that only rarely see livestock.

Under such conditions a seasonal restriction may be all that is needed to protect a whole series of sites.

Certain types of soils and sediments may also be more prone to livestock effects under specific weather conditions. Soft sediments and clay soils may be much more susceptible to the hoof action of livestock in wet conditions than dry. Sites found in these areas, within these sediment types, would be more open to adverse effects, as the sediments themselves become more susceptible. Again, a seasonal restriction may be all that is necessary to protect sites in these settings.

Location of Range Improvements

Livestock are controlled by the use of a whole series of range improvements, such as fence lines, corrals, water sources, salt licks, and drive ways. All of these improvements have the tendency to focus livestock use into certain areas, concentrating the related adverse effects. When cultural resource sites are found in the vicinity of these improvements, the adverse impacts on these sites can go up significantly.

In many cases these effects can be mitigated by moving the range improvement. Fences can be constructed around, rather than through, sites. Watering troughs can be constructed or moved away from sites, as can be corrals and other improvements. Removing the reason for livestock congregation would have a positive effect on any site in the vicinity.

Livestock congregation at a watering source not only intensifies livestock use of the source area itself, but also increases livestock use of the surrounding area. Glen Canyon data indicate that cattle tend to stay within a 2-mile radius of their water source (NPS 1999, p. 22), meaning that livestock will impact sites within that 2-mile radius to a greater degree than outside that area. If a watering source or corral is found within or proposed for an area of high site density, it may be prudent to move that improvement to an area of lesser site density.

Both the BLM GSENM and NPS Glen Canyon have the ability to develop accurate maps plotting the location of cultural resource sites. Maps can also be generated depicting the areas generally used by cattle (more accurate maps of utilization are proposed see *Research*, below). Using these two data sets together, especially in conjunction with permittee input, should provide a tool that could help plan the location of range improvements to minimize the adverse impacts on cultural resources. Information can be shared between GSENM and Glen Canyon as needed and as outlined in the programmatic agreement developed for this EIS.

Livestock Herding and Driving Techniques

Herding techniques have changed dramatically over the past few decades. For well over 100 years, the horse was the herding means of choice, and often the only choice, for herding, monitoring, and driving livestock. Even after automobiles became common in rural Utah, the lack of roads and suitable automotive trails dictated that, for many tasks, the horse remained the principal means of transportation. With the advent of the off-road motorcycle and all-terrain vehicles (ATVs and related vehicle types), the horse has in many cases taken a back seat to motorized vehicles.

ATVs have been recognized as a serious problem on BLM-administered and NPS-managed lands. By increasing the accessibility of distant parts of the landscape, they have also increased the accessibility of cultural resource sites on that landscape. ATV use on cultural resource sites has an immediate destructive effect and increases the overall rate of secondary erosion. Restricting the use of ATVs and similar vehicles where such activities are impacting cultural resource sites would remove a serious threat to these sites.

Changes in Range Management Practices

Such practices as clearing and seeding to increase the forage in a given area eventually draw livestock to these areas. The clearing operations themselves, such as chaining and dozer pushes, can have immediately disastrous consequences for cultural resource sites. And then, as the seeding matures and cattle are drawn to the project area, additional grazing-related adverse impacts on sites in that area may increase. If cultural resource sites were protected during the clearing operations by leaving them in undisturbed tree islands, cattle may later be drawn to them for the shade they provide in an otherwise open setting. The sites are then open to adverse effects by not just a few cattle wandering by, but by larger numbers of cattle drawn by the very factors designed to protect the site. These islands could also draw unwanted human attention to cultural resource sites.

Future large-scale range improvement projects, such as seedings, should be planned in conjunction with cultural resource specialists. This should be done to ensure that cultural resource sites are taken into consideration and that potential adverse effects can be mitigated prior to project implementation. In the seeding example noted above, hand-thinning the remaining tree cover on the cultural resource site to match the surrounding vegetation density would not adversely impact the site and would leave no reason for livestock to concentrate in that location.

Reduction of AUMs

AUMs reflect the number of head of livestock that are permitted to graze in a certain location for a certain time span. Investigation and research for this EIS has shown that stocking rates are only one of a suite of factors influencing adverse impacts on cultural resource sites. However, the amount of impact a cultural resource site might suffer from livestock is, to a certain degree, proportional to the number of livestock on that site at any given time. Reducing the number of livestock will therefore reduce livestock-related adverse effects, although direct measurements of potential adverse effects reduction would depend on a variety of factors and would be specific to the sites in question. AUM reduction does not completely avoid adverse effects. Although adverse effects would be minimized with the reduction of livestock, as long as some livestock remain, adverse effects would remain.

Area Closures

Closures to livestock, either on a temporary or permanent basis, is the only mitigation strategy that would remove all potential for grazing-related adverse effects on anything above a site-by-site basis. Closures would be used as a form of mitigation only when it is apparent that no other potential mitigation actions would meet protection requirements or where all other attempts had failed to realize the necessary levels of protection.

Closures would generally be considered as a last line of defense for areas where multiple sites or cultural landscapes are being adversely affected. Any closures of areas large enough to reduce AUMs would require a land use plan amendment and consultation with the permittees and other interested parties. Such closures, even when intended for cultural resource protection, could serve as scientific control areas for a wide variety of other resources (see *Research*, below, for additional details and discussion).

Closure of certain areas would act as a scientific control, compared to areas left open to livestock. This would be an important aspect when considering livestock effects, both direct (livestock on the sites) and indirect (such as erosion exacerbated by livestock use), as compared to other, non-livestock-related adverse effects.

Restrictions for scientific purposes should be planned to take full advantage of the research potential. Areas with a variety of site types should be considered, but the restricted and open portions of the research areas should be as similar in the geographic and cultural landscapes as possible. This allows the researcher to make a parallel comparison.

Cultural Tools for Site Protection

Inventory

Approximately 7 percent of the decision area has been comprehensively surveyed for cultural resources. While many range improvements are included in this 7 percent, some older improvements and development projects were implemented or established prior to standard cultural resource surveys. Inventory is needed at those actively grazed locations that have never been surveyed and will be needed at proposed project locations. Certain projects, such as installing salt licks or watering locations, will tend to concentrate livestock. With such projects, inventory should not be limited to the specific development location but must take into account the effect of livestock concentration in the area surrounding the improvements.

Glen Canyon calls for a 2-mile radius inventory around water development projects (NPS 1999:22); the survey area associated with livestock-concentrating projects on BLM-administered lands will be decided on a case-by-case basis and will take into account terrain, site potential, site types, numbers of livestock, livestock behavior, and type of project. Direction as to when inventory is necessary, and to what extent, is outlined in BLM Handbook 8120, Appendix 10, and BLM Instruction Memorandum No. UT-2010-026 (and additional references included therein).

Future inventory across the decision area will generally be in response to NHPA Section 106 compliance or Section 110 obligations. The extent and location of Section 106 inventories would be largely determined by the specifics of the project generating the need for inventory. Section 110 inventories should be directed at locations or topographic features likely to harbor site types known to be at risk from livestock, locations that tend to attract livestock, areas of known or suspected high site density, or locations that address certain research topics and needs. Larger areas that have seen little or no inventory but that are used for a significant amount of grazing should be surveyed to identify at-risk sites and to establish the cultural resource character of the area.

Detailed Site Recording and Collection

Cultural resource sites are generally documented by recording certain data on specially prepared site forms. Many factors can influence what kind and the amount of information that makes it onto a site form. Early site forms often lacked many categories that today are considered required information. An example of this is impacts on sites. Most site forms from 30 or 40 years ago did not even include a category or space for noting specific site adverse effects and instead may have had only a check box for site condition: good, fair, or poor. The rare comments on specific adverse effects, if any, would be added in the narrative portion of the site form, and these narratives themselves were often not as detailed as modern procedures require.

In some specific cases, detailed recording or re-recording of a site may be all that is necessary for mitigation. For example, sites that have been heavily impacted in the past and retain little integrity may be adequately documented by a thorough recording process and artifact collection and curation. Recording and collection as mitigation should be reserved for sites where it is apparent that these actions alone will retrieve any scientific information left at those sites.

At the very least, detailed recording should be seen as the beginning of the documentation process. It is a requirement prior to any collection, testing, or full excavation. And if any reasonable form of scientific monitoring is to be accomplished, a detailed record of the site before the monitoring process begins is a must. Only then can changes in site condition, artifact counts and dispersal patterns, and future adverse effects be accurately tracked.

Archaeological Testing and Data Recovery Excavation

Archaeological testing of a site refers to test excavations to determine its character, depth, cultural affiliation, and eligibility for listing on the National Register. Test excavations are usually restricted in scope and nature and involve a few small test plots or trenches. Testing can provide a host of information without the destruction and cost involved in larger scale excavations. It can often provide the level of information needed to make informed decisions regarding management direction for that site. Testing and excavation can often provide information not just about that specific site, but about other nearby sites in similar settings and apparent cultural affiliation. Thus the testing of one site may provide insight to the management needs of numerous sites. While testing, like excavation, is a destructive process, it is performed on a scale small enough that the overall integrity of the site is not impaired.

Data recovery excavation of cultural resource sites is a destructive process, and once a site has been excavated it cannot be re-assembled and protected. Excavation is generally used in situations where the site is in imminent danger of destruction and some form of data retrieval is necessary, or in situations where important scientific research questions cannot be answered by other, non-destructive means. As a mitigation tool, excavation should be considered a last resort. Excavation can provide a host of scientific information that cannot be had otherwise, but it is costly, can be time consuming, and results in the loss of some, or all, of the cultural resource site. Excavation may well be the most suitable form of mitigation at sites that have been heavily impacted or at sites that may suffer significant loss of integrity from a development project. Any proposed excavations must be preceded by Native American and SHPO

consultation. They would include other consulting parties as appropriate and would require the development of a specific treatment plan.

Monitoring

Monitoring is a necessary component of any cultural resource program. Federal archaeologists have monitoring programs in place, but these are generally either site specific, are performed on an as-needed or when-possible basis, and respond to a variety of projects and effects. This EIS project highlights the need for a more comprehensive inventory and monitoring program designed to identify, quantify, assess, and monitor impacts on cultural resource sites based on livestock use and related factors.

Baseline data on the condition of sites are generally collected at the time the site is recorded. However, many older site forms did not adequately address impacts on the sites, and grazing-related adverse effects were not always recognized or given much weight on the list of site impacts. Within the past two or three decades this has begun to change, as archaeologists gain a broader understanding of the nature of various impacts, especially those related to grazing. Monitoring provides baseline data where necessary and allows tracking of resource conditions over time. Monitoring is also included as part of the discussion regarding research.

While inventory provides a first look and recording episode for cultural resource sites, monitoring provides the basic information by which changes to the site can be measured. A portion of the monitoring program could be a research component directed at identifying and investigating the specific agents of livestock-related adverse effects at archaeological and historic sites. Examples are direct adverse effects from livestock, erosion associated with livestock use, development of range projects, maintenance of range improvements, and increased accessibility and visitation resulting from range improvements. Monitoring would be required to track changes in site condition and is also necessary to track the effectiveness of different mitigation measures applied to various cultural resource sites.

Management must have the information necessary to make informed decisions in the future as to what forms of mitigation may better apply to various site types, which techniques have been shown to work, and which did not prove effective. Although inventory and monitoring are not mitigation measures in themselves, they are a vital part of an overall mitigation plan. The importance of monitoring cannot be overemphasized.

Research

Continuing research is an important aspect of any cultural resource program. A fair amount of research has been done over the past two or three decades into grazing-related adverse impacts on cultural resources, but most of these studies have been relatively small and short term. Research at GSENM includes a recently concluded five-year inventory and monitoring program designed to characterize historic Property conditions in 22 different allotments. It has been used as the basis for the cultural resource existing conditions assessment reported in this MMP-A EIS. An ongoing, long-term monitoring study, began in 2005 and is comparing two specific sets of sites, one ungrazed and the other grazed annually. This is an ambitious 15-year project that, when completed, will result in the most comprehensive study of its kind to date.

The foraging behavior of cattle is another potential area of research. As noted above, there is some indication that cattle will tend to stay within two miles of a water source (NPS 1999:22). However, this sphere of influence probably depends on a series of factors, including such variables as terrain, forage, and weather.

Modern technology provides the chance to pursue an avenue of research that perhaps has not been addressed before: the actual movement of cattle across the landscape. By placing GPS tracking devices on cattle, their movements in specific types of terrain and under specific conditions can be tracked. This information would be valuable in predicting livestock movement in relation to cultural resource sites and could be an important management tool.

Continuing to collect local oral histories is a final portion of this research program. Interviews conducted with long-time area residents can address the history of the ranching and livestock industry in the decision area and can help describe range conditions and how they have changed over the past several decades. Also included here is a GSENM proposal to develop a comprehensive grazing and ranching history of the EIS area; this may be particularly important in that the ranching lifestyle of the past few decades is quickly becoming a thing of the past, and no such grazing history of any detail has yet been accomplished.

References Cited

Cinnamon, Steve. 1986. "Potsherd survey to determine impacts of visitor use and grazing at Wupatki-Sunset Crater National Monument." Presentation at the Fourth Triennial Conference on Research in the National Parks and Equivalent Reserves, Colorado State University, Fort Collins.

Geib, Phil R., Jim H. Collette, and Kimberly Spurr. 2001. Kaibabitsinungwu: An Archaeological Sample Survey of the Kaiparowits Plateau. Cultural Resources Series No. 25, Grand Staircase-Escalante National Monument Special Publication No. 1, USDI Bureau of Land Management, Salt Lake City, Utah.

Geib, Phil R. 1989. Archaeological Survey of Lower Glen Canyon Benches and a Descriptive Model of General Site Location. Northern Arizona University Report 1011, Flagstaff.

Judd, Neil M. 1926. "Archaeological observations north of the Rio Colorado." *Bureau of American Ethnology* Bulletin 82.

Nielson, Axel E. 1991. "Trampling the archaeological record: An experimental study." *American Antiquity* 56(3):483-503.

NPS (US Department of the Interior, National Park Service). 1999. Glen Canyon National Recreation Area Grazing Management Plan and Finding of No Significant Impact. NPS, Glen Canyon National Recreation Area, Page, Arizona. August 1999.

Popelish, Linda, 2001. Prewitt/6A Allotment Management Plan. Report on file, Mt. Taylor Ranger District, Cibola National Forest, New Mexico.

This page intentionally left blank.

Glossary

GLOSSARY

Active use. The current authorized use, including livestock grazing and conservation use. Active use may constitute a portion, or all, of permitted use. Active use does not include temporary nonuse or suspended use of forage within all or a portion of an allotment (43 CFR, Subpart 4100.0-5).

Actual use. Where, how many, what kind or class of livestock, and how long livestock graze on an allotment, or on a portion or pasture of an allotment (43 CFR, Subpart 4100.0-5).

Air basin. A land area with generally similar meteorological and geographic conditions throughout. To the extent possible, air basin boundaries are defined along political boundary lines and include both the source and receptor areas.

Air pollution. Degradation of air quality resulting from unwanted chemicals or other materials occurring in the air.

Air quality classes. Classifications established under the Prevention of Significant Deterioration portion of the Clean Air Act, which limits the amount of air pollution considered significant within an area. Class I applies to areas where almost any change in air quality would be significant; Class II applies to areas where the deterioration normally accompanying moderate, well-controlled growth would be insignificant; and Class III applies to areas where industrial deterioration would generally be insignificant.

Alcove pool. A perennial and ephemeral pool beneath a bedrock pour-off.

Allotment management plan. A documented program developed as an activity plan, consistent with the definition at 43 USC, Subsection 1702(k), that focuses on, and contains the necessary instructions for, the management of livestock grazing on specified public lands to meet resource condition, sustained yield, multiple use, economic and other objectives (43 CFR, Subpart 4100.0-5).

Allotment. An area of land designated and managed for grazing of livestock (43 CFR 4100.0-5).

Alternative. One of at least two proposed means of accomplishing planning objectives by which the BLM can meet its purpose and need.

Ambient air quality. The state of the atmosphere at ground level as defined by the range of measured or predicted ambient concentrations of all significant pollutants for all averaging periods of interest.

Amendment. The process for considering or making changes in terms, conditions, and decision of an approved land use plan (BLM H-1601-1).

Animal unit month (AUM). An AUM is the amount of forage necessary for the sustenance of one cow or its equivalent for a period of 1 month (43 CFR 4100.0-5).

Aquatic. Living or growing in or on the water.

Assessment, Inventory, and Monitoring (AIM). The AIM strategy provides a process for the BLM to collect quantitative information on location and abundance, condition, and trend of renewable resources on the nation's public lands.

Atmospheric deposition. Air pollution produced when acid chemicals are incorporated into rain, snow, fog, or mist and fall to the Earth. Sometimes referred to as acid rain, it comes from sulfur oxides and nitrogen oxides, products of burning coal and other fuels and from certain industrial processes. If the acid chemicals in the air are blown into the area where the weather is wet, the acids can fall to the Earth in rain, snow, fog, or mist. In areas where the weather is dry, the acid chemicals may become incorporated into dust or smoke.

Attainment area. A geographic area in which levels of a criteria air pollutant meet the health-based National Ambient Air Quality Standard for that specific pollutant.

Available (for livestock grazing). A resource management plan-level decision that allows livestock grazing use under a permit or lease based on livestock carrying capacity and resource conditions in an allotment; grazing lands that are not in suspension.

Big game. Indigenous ungulate wildlife species that are hunted, such as elk, deer, bison, bighorn sheep, and pronghorn antelope.

Biological soil crust. Comprised of cyanobacteria, fungi, and lichen growing in a symbiotic relationship on the soil surface (Bryce et al. 2012).

Carbon dioxide equivalents (CO_2e). Greenhouse gas emissions are tracked as carbon dioxide equivalents, with one gram of carbon dioxide molecule counting as one, and other greenhouse gas molecules counting as some multiple.

Causal factor. An element that produces an effect, result, or condition; something or someone that makes something happen or exist.

Chemical vegetation treatment. Application of herbicides to control invasive species, noxious weeds, or unwanted vegetation.

Climate change. Any significant change in measures of climate (such as temperature, precipitation, or wind) lasting for an extended period (decades or longer). Climate change may result from the following:

- Natural factors, such as changes in the sun's intensity or slow changes in the Earth's orbit around the sun
- Natural processes in the climate system (e.g., changes in ocean circulation)
- Human activities that change the atmosphere's composition (e.g., driving automobiles) and the land surface (e.g., deforestation, reforestation, urbanization, and desertification)

Contributing factor. An element that plays a significant part in bringing about an end or result.

Criteria pollutant. The United States Environmental Protection Agency uses six "criteria pollutants" as indicators of air quality and has established for each of them a maximum concentration above which adverse effects on human health may occur. These threshold concentrations are called National Ambient Air Quality Standards. The criteria pollutants are ozone, carbon monoxide, nitrogen dioxide, sulfur dioxide, particulate matter, and lead.

Decision area. The lands in the planning area where the BLM and the NPS have authority to make land use and management decisions. The BLM's decision area for this plan amendment includes all BLM-managed lands for which GSENM has livestock grazing administration responsibility, including some lands in the BLM Kanab and Arizona Strip Field Offices. The NPS decision area includes lands in Glen Canyon for which GSENM has livestock grazing administration responsibility. The decision area does not include state, municipal, or private lands.

Ecological site. A distinctive kind of land with specific physical characteristics that differs from other kinds of land in its ability to produce a distinctive kind and amount of vegetation.

Ecoregion. Areas identified through the analysis of the patterns and the composition of biotic and abiotic phenomena that affect or reflect differences in ecosystem quality and integrity. These phenomena include geology, physiography, vegetation, climate, soils, land use, wildlife, and hydrology. The relative importance of each characteristic varies from one ecological region to another regardless of the hierarchical level.

Environmental Impact Statement. A detailed written statement as required by Section 102(2)(c) of the National Environmental Policy Act (40 CFR 1508.11).

Ephemeral. Containing running water only sporadically and in direct response to precipitation.

Essential fish habitat. Those waters and substrate necessary to fish for spawning, breeding, or growth to maturity.

Exotic species. An introduced, nonnative species, or a species that is the result of direct or indirect, deliberate or accidental introduction of the species by humans, and for which introduction permitted it to cross a natural barrier to dispersal.

Federal Land Policy and Management Act of 1976. The Federal Land Policy and Management Act (Public Law 94-579) establishes public land policy and guidelines for public land administration and provides for the management, protection, development, and enhancement of the public lands. Section 202 provides information on land use planning. The Federal Land Policy and Management Act was passed on October 21, 1976.

Fundamentals of rangeland health. Overarching principles of rangeland health, listed at 43 CFR, Subpart 4180.1, which establish the Department of the Interior's policy of managing for healthy rangelands (60 *Federal Register* at 9954). State or regional standards and guidelines must provide for conformance with the Fundamentals of Rangeland Health (43 CFR, Subpart 4180.2[b]).

Glen Canyon Grazing Management Plan. The Grazing Component of the General Management Plan prepared by the National Park Service for the Glen Canyon National Recreation Area. The Grazing Management Plan is composed of several elements: 1) descriptions of the existing resource protection and grazing administrative responsibilities of the NPS and BLM; 2) an assessment of the current range condition by resource; 3) goals, objectives, and recommendations for grazing practices and management actions; and 4) maximum grazing intensities (utilization) compatible with the purpose of the recreation area. The Glen Canyon Grazing Management Plan was finalized in 1999.

Grazing lease. A document authorizing use of the public lands outside an established grazing district. Grazing leases specify all authorized use including livestock grazing, suspended use, and conservation use. Leases specific the total number of AUMs apportioned, the area authorized for grazing use, or both (43 CFR, Subpart 4100.0-5).

Grazing permit. A document authorizing use of the public lands within an established grazing district. Grazing permits specify all authorized use including livestock grazing, suspended use, and conservation use. Permits specify the total number of AUMs apportioned, the area authorized for grazing use, or both. (43 CFR, Subpart 4100.0-5).

Grazing preference. A superior or priority position against others for the purpose of receiving a grazing permit or lease. This priority is attached to base property owned and controlled by a permittee or lessee. (43 CFR, Subpart 4100.0-5).

Guideline. A practice, method, or technique determined to be appropriate to ensure that standards can be met or that significant progress can be made toward meeting the standard. Guidelines are tools such as grazing systems, vegetative treatments, or improvement projects that help managers and permittees achieve standards. Guidelines may be adapted or modified when monitoring or other information indicates the guideline is not effective, or a better means of achieving the applicable standard becomes appropriate (BLM Handbook H-4180-1).

Habitat. An environment that meets a specific set of physical, biological, temporal, or spatial characteristics that satisfy the requirements of a plant or animal species or group of species for part or all of their life cycle.

Hanging garden. An assemblage of aquatic and semi-aquatic plants and animals at small spring-fed seeps on porous stone canyon walls.

Historic property. Defined in the NHPA as "any prehistoric or historic district, site, building, structure, or object included in, or eligible for inclusion on the National Register"; such term includes artifacts, records, and remains that are related to such district, site, building, structure, or object (16 USC, Subsection 470[w][5]).

Instant study area. One of the 55 primitive and natural areas formally identified by the BLM through a final action published in the Federal Register before November 1, 1975. FLPMA required an accelerated wilderness review of these wilderness study areas.

Invasive plants. Plants that are not part (if exotic) of or are a minor component (if native) of the original plant community or communities that can become a dominant or co-dominant species on the site if their future establishment and growth is not actively controlled by management interventions, or are classified as exotic or noxious plants under state or federal law. Species that become dominant for only one to several years (e.g., short-term response to drought or wildfire) are not invasive plants (BLM Handbook H-1740-2, Integrated Vegetation Management).

Invertebrate. An animal lacking a backbone or spinal column.

Land health. Degree to which the integrity of the soil and the ecological processes of ecosystems are sustained (BLM Handbook H-4180-1).

Land use plan. A resource management plan, developed under the provisions of 43 CFR, Part 1600, or a management framework plan. These plans are developed through public participation in accordance with the provisions of the Federal Land Policy and Management Act of 1976 (43 USC, Section 1701 et seq.) and establish management direction for resource uses of public lands (43 CFR, Subpart 4100.0-5).

Lentic. Standing water habitat, such as lakes, ponds, seeps, bogs, and meadows.

Livestock carrying capacity. The maximum stocking rate possible without damaging vegetation or related resources. The rate may vary from year to year in the same area as a result of fluctuating forage production (43 CFR, Subpart 4100.0-5).

Lotic. Flowing water habitat such as rivers and streams.

Monitoring. The periodic observation and orderly collection of data to evaluate: 1) effects of management actions; and 2) effectiveness of actions in meeting management objectives (43 CFR, Subpart 4100.0-5).

Monument Management Plan (MMP). The MMP is a land use plan that contains a set of decisions that establish management direction for BLM-managed land in GSENM. The MMP was prepared in 1999, under the provisions of the Federal Land Policy and Management Act, and became effective in February 2000.

National Environmental Policy Act of 1969. The National Environmental Policy Act (Public Law 91-190) establishes a national policy for the environment, provides for the establishment of a Council on Environmental Quality, and more. The National Environmental Policy Act ensures that environmental information is available before decisions are made and before actions are taken.

Native. All species of plants and animals naturally occurring, either presently or historically, in any ecosystem of the US (BLM Manual 1745, Introduction, Transplant, Augmentation, and Reestablishment of Fish, Wildlife, and Plants).

Nonnative Invasive Species. An alien species whose introduction does or is likely to cause economic or environmental harm or harm to human health (Executive Order 13112).

Noxious weed: A plant species designated by federal or state law as generally possessing one or more of the following characteristics: aggressive and difficult to manage; parasitic; a carrier or host of serious insects or disease; or nonnative, new, or not common to the United States (BLM Handbook H-1740-2, Integrated Vegetation Management).

Ozone. A faint blue gas produced in the atmosphere from chemical reactions of burning coal, gasoline, and other fuels and chemicals found in products such as solvents, paints, and hairsprays.

Paleontological resources. The physical remains or other physical evidence of plants and animals preserved in soils and sedimentary rock formations. Paleontological resources are important for correlating and dating rock strata and for understanding past environments, environmental change, and the evolution of life.

Particulate matter (PM). One of the six criteria pollutants for which the United States Environmental Protection Agency established National Ambient Air Quality Standards. Particulate matter is defined as fine particulates, with an aerodynamic diameter of 10 micrometers (PM_{10}) or less, and fine particulates, with an aerodynamic diameter of 2.5 micrometers or less ($PM_{2.5}$).

Perennial. A water body that contains water year-round.

Permitted use. The forage allocated by or under the guidance of an applicable land use plan for livestock grazing in an allotment under a permit or lease and is expressed in AUMs (43 CFR 4100.0-5).

Planning area. The geographic area encompassing lands for which the BLM and the NPS will make decisions during this planning effort. The planning area encompasses approximately 2,316,200 acres in Garfield and Kane Counties, Utah, and Coconino County, Arizona. Small areas of state, municipal, and private lands are contained within the planning area.

Planning criteria. The standards, rules, and other factors developed by managers and interdisciplinary teams for their use in forming judgments about decision-making, analysis, and data collection during planning (BLM H-1601-1).

Planning issues. A matter of controversy over resource management activities or land use that is well defined and entails alternative actions or decisions.

Prevention of significant deterioration. An air pollution permitting program intended to ensure that air quality does not diminish in attainment areas. PSD sets limits on the amount of air pollution considered significant in an area. Class I applies to areas where almost any change in air quality would be significant; Class II applies to areas where the deterioration normally accompanying moderate well-controlled growth would be insignificant; and Class III applies to areas where industrial deterioration would generally be insignificant.

Range improvement. An authorized physical modification or treatment that is designed to improve production of forage; change vegetation composition; control patterns of use; provide water; stabilize soil and water conditions; and restore, protect, and improve the condition of rangeland ecosystems to benefit livestock, wild horses and burros, and fish and wildlife. The term includes, but is not limited to, structures, treatment projects, use of mechanical devices, or modifications achieved through mechanical means (43 CFR 4100.0-5).

Range rider. A person provided by the permittee to manage livestock while they are on public land.

Rangeland health. The degree to which the integrity of the soil and ecological processes of rangeland ecosystems are sustained. Rangeland health exists when ecological processes are functioning properly to maintain the structure, organization, and activity of the system over time (BLM Handbook H-4180-1).

Rangeland health assessment. The degree to which the integrity of the soil and ecological processes of rangeland ecosystems are sustained. Rangeland health exists when ecological processes are functioning properly to maintain the structure, organization and activity of the system over time. A three-step process is used to determine whether rangeland health standards are being met on BLM-administered lands:

- Assessment. The estimation or judgment of the status of ecosystem structures, functions, or processes, within a specified geographic area (preferably a watershed or a group of contiguous watersheds) at a specific time. An assessment is conducted by gathering, synthesizing, and interpreting information, from observations or data from inventories and monitoring. An assessment characterizes the status of resource conditions so that the status can be evaluated (see definition of evaluation) relative to land health standards. An assessment sets the stage for an evaluation. An assessment is not a decision.
- Evaluation. An evaluation is conducted to arrive at two outcomes. Firstly, an evaluation conducts an analysis and interpretation of the findings resulting from the assessment, relative to land health standards, to evaluate the degree of achievement of land health standards. Secondly, an evaluation conducts an analysis and

interpretation of information—be it observations or data from inventories and monitoring—on the causes for not achieving a land health standard. An evaluation of the causes provides the foundation for a determination (see definition for determination). An evaluation goes further than an assessment because an evaluation takes what the assessment provides–which is the status of resource conditions characterized by the appropriate indicators–and evaluates them according to land health standards. Then, this leads to a prognosis of: land health standard achieved; making significant progress toward achieving a land health standard; or land health standard not achieved. If the land health standard is not achieved, the evaluation of the causes allows a determination to be made. In summary, an evaluation builds on the assessment, and the evaluation sets the stage for a determination.

- Determination. Document recording the BLM Authorized Officer's finding that existing grazing management practices or levels of grazing use on public lands grazing either are or are not significant factors in failing to achieve the standards and conform with the guidelines within a specified geographic area (preferably watershed or a group of contiguous watersheds). (BLM H-4180-1.)

Reference area. A defined geographic area on the landscape used as the control group when studying the effects of grazing on a vegetation community.

Relict plant community. A plant community that presently occurs in a restricted area, but whose original range was more widespread in the past.

Reserve common allotment. An area that is designated in the land use plan as available for livestock grazing but reserved as an area available for use as an alternative to grazing in another allotment in order to facilitate rangeland restoration treatments and recovery from natural disturbances such as drought or wildfire. The reserve common allotment would provide needed flexibility that would help the agency apply temporary rest from grazing where vegetation treatments and/or management would be most effective.

Resources and values. For Glen Canyon, this term is used when referring to specific resources or resources in general. The Glen Canyon Foundation Document defines the term as "those features, systems, processes, experiences, stories, scenes, sounds, smells, or other attributes determined to warrant primary consideration during planning and management processes because they are essential to achieving the purpose of the park and maintaining its significance.

Riparian area. A form of wetland transition between permanently saturated wetlands and upland areas. These areas exhibit vegetation or physical characteristics reflective of permanent surface or subsurface water influence. Lands along, next to, or contiguous with perennially and

intermittent flowing rivers and streams, glacial potholes, and the shores of lakes and reservoirs with stable water levels are typical riparian areas (Leonard et al. 1992 p. 7[1]).

Scoping. The process by which the BLM solicits internal and external input on the issues and effects that will be addressed, as well as the degree to which those issues and effects will be analyzed in the NEPA document. Scoping is one form of public involvement in the NEPA process. Scoping occurs early in the NEPA process and generally extends through the development of alternatives. External scoping, also known as formal scoping, involves notification and opportunities for feedback from other agencies, organizations, and the public (BLM H-1790-1).

Seeding. Nonstructural range improvements include seedings and other vegetation treatments. A rangeland seeding is a type of nonstructural range improvement where a vegetation type or community has been established through the artificial dissemination of seed. Seedings include the application of grass, forb, or shrub seed, either aerially or from the ground. Seeding allows the establishment of native species or placeholder species and restoration of disturbed areas to a perennial-dominated cover type, thereby decreasing the risk of subsequent invasion by exotic plant species.

Soil degradation susceptibility. Calculated from the standard BLM soil interpretation "Site Degradation Susceptibility," which rates each soil for its susceptibility for soil degradation to occur during disturbance, which is a function of resistance to degradation. The ratings represent the relative risk of water and wind erosion, salinization, sodification, organic matter and nutrient depletion and/or redistribution, and loss of adequate rooting depth to maintain desired plant communities.

Soil degradation susceptibility for a given soil map unit is the area-weighted sum of the Site Degradation Susceptibility ratings for each susceptibility factor for each soil component, normalized to the percentage of map unit area that was rated. "Highly Susceptible" and "Moderately Susceptible" ratings are totaled separately.

- A soil map unit's soil degradation susceptibility is "High" if its area-weighted normalized sum "Highly Susceptible" rating is greater than one. This is equivalent to having more than one highly susceptible factor across 100 percent of the map unit.
- A soil map unit's soil degradation susceptibility is "Moderate" if its area-weighted normalized sum "Highly Susceptible" rating is greater than zero but less than or equal to one, or if its area-weighted normalized sum "Moderately Susceptible" rating is greater than one.
- A soil map unit's soil degradation susceptibility is "Low" if its area-weighted normalized sum "Highly Susceptible" rating equals zero and area-weighted normalized sum "Moderately Susceptible" rating is less than or equal to one.

[1] Leonard, S., G. Staidl, J. Fogg, K. Gebhardt, W. Hagenbuck, D. Pritchard. 1992. Procedures for Ecological Site Inventory with Special Reference to Riparian-Wetland Sites. Technical Reference TR-1737-7. Bureau of Land Management. Denver, Colorado.

Special recreation management area (SRMA). BLM administrative units where the existing or proposed recreation opportunities and recreation setting characteristics are recognized for their unique value, importance, or distinctiveness, especially as compared to other areas used for recreation.

Spring. A location where water wells up from an underground source.

Standard. Standards of land health are expressions of levels of physical and biological condition or degree of function required for healthy lands and sustainable uses, and define minimum resource conditions that must be achieved and maintained (BLM Handbook H-4180-1).

Stocking rate. The number of specific kinds and classes of animals grazing or utilizing a unit of land for a specific period of time. It may be expressed as animals per acre, hectare, or section or the reciprocal (area of land per animal). When dual use is practiced (e.g., cattle and sheep), the stocking rate is often expressed as animals per unit of land or the reciprocal (NRCS 2003, p. Glossary-55).

Suspension. The temporary withholding from active use, through a decision issued by the authorized officer or by agreement, of part or all of the permitted use in a grazing permit or lease. (43 CFR, Subpart 4100.0-5).

Temporary nonuse. The withholding, on an annual basis, of all or a portion of permitted livestock use in response to a request of the permittee or lessee (43 CFR, Subpart 4100.0-5).

Tinajas. Surface pockets (depressions), formed in bedrock that occur below waterfalls, that are carved out by spring flow or seepage or are caused by sand and gravel scouring intermittent streams (arroyos).

Trailing only. A plan implementation decision that would allow only trailing activities through an allotment. Trailing is herding and moving livestock from one pasture or allotment into another. The allotment is otherwise unavailable for livestock grazing.

Trend. The direction of change over time, either toward or away from desired management objectives (43 CFR, Subpart 4100.0-5).

Unallotted. Public lands open to grazing that currently have no livestock grazing authorized.

Unavailable (for livestock grazing). A resource management plan-level decision that would not allow livestock grazing use under a permit or lease; grazing lands that are in suspension.

Ungrazed. Lands that do not currently have or have not historically had domestic livestock utilizing available forage.

Ungrazed reference area. This is an allotment or portion of an allotment that has not been grazed by livestock for at least 10 years. These areas represent ecological sites and can be used for comparing the impacts of livestock on grazed areas with the ungrazed area.

Utilization. The portion of forage that has been consumed by livestock, wild horses and burros, wildlife, and insects during a specified period. The term is also used to refer to the pattern of such use (43 CFR, Subpart 4100.0-5).

Values and purposes. For Glen Canyon, this refers to language taken directly from Glen Canyon's enabling legislation and is used in the context of the park's purpose and creation. The terminology is carried over the Glen Canyon Grazing Management Plan, which further defines the values.

Visibility (air quality). A measure of the ability to see and identify objects at different distances.

Wetland. Those areas inundated or saturated by surface water or groundwater at a frequency and duration sufficient to support, and that under normal circumstances do support, a prevalence of vegetation typically adapted for life in saturated soil conditions. Wetlands generally include swamps, marshes, bogs, and similar areas (United States Army Corps of Engineers 1987 p. 9).

This page intentionally left blank.

Chapter 1

Introduction

TABLE OF CONTENTS

Chapter Page

TABLE

Page

FIGURES

Page

This page intentionally left blank.

1. INTRODUCTION

DO NOT DELETE THIS PAGE from the MS Word file, as this is what marks Heading 1 for the table of contents. (Do delete this page later from the Adobe Acrobat [pdf] file.)

THROW THIS PAGE AWAY & DELETE FROM PDF

Chapter 1
Introduction

The US Department of the Interior (DOI), Bureau of Land Management (BLM), Grand Staircase-Escalante National Monument (GSENM), as the lead agency, has prepared this draft Environmental Impact Statement (EIS) and Livestock Grazing Management Plan{ XE "Grazing Management Plan, Glen Canyon (GzMP 1999)" } Amendment (MMP{ XE "Monument Management Plan, Grand Staircase-Escalante National Monument (MMP 2000)" }-A). It is a guide for managing BLM lands in GSENM, as well as lands for which GSENM has administrative responsibility for livestock grazing, specifically portions of the BLM's Kanab Field Office (KFO) and Arizona Strip Field Office (ASFO) and National Park Service (NPS)-managed lands in Glen Canyon National Recreation Area (Glen Canyon).

The objectives of this document are as follows:

- To provide direction for managing livestock grazing in GSENM and the land where GSENM administers livestock grazing
- To analyze the social, economic, and environmental effects that could result from implementing the alternatives addressed in the MMP{ XE "Monument Management Plan, Grand Staircase-Escalante National Monument (MMP 2000)" }-A

This MMP{ XE "Monument Management Plan, Grand Staircase-Escalante National Monument (MMP 2000)" }-A has been prepared using BLM planning regulations and guidance issued under the authority of the Federal Land Policy and Management Act{ XE "Federal Land Policy and Management Act (FLPMA)" } (FLPMA) of 1976 (43 US Code [USC], Section 1701 et seq.) and the BLM's Land Use Planning Handbook, H-1601-1 (BLM 2005), as amended. An EIS is incorporated into this document to meet the requirements of the National Environmental Policy Act{ XE "National Environmental Policy Act (NEPA)" } of 1969 (NEPA), Council on Environmental Quality{ XE "Council on Environmental Quality (CEQ)" } (CEQ) regulations for implementing NEPA (40 Code of Federal Regulations [CFR], Parts 1500-1508), DOI NEPA regulations (43 CFR, Part 46), and the requirements of the BLM's NEPA Handbook, H-1790-1 (BLM 2008a).

The land use planning process is the key tool the BLM uses to manage resources and to designate uses on the lands it administers, in coordination with tribal, other federal, state, and local governments, land users, and interested members of the public. To help navigate this document, **Figure 1-1**, Document Organization, provides an outline of this MMP**{** XE "Monument Management Plan, Grand Staircase-Escalante National Monument (MMP 2000)" **}**-A/EIS and describes the information found within each section.

Figure 1-1
Document Organization

Executive Summary
Summarizes the content in the MMP-A/EIS.

Chapter 1 Introduction
Presents the proposed action, purpose and need, and decisions to be made in the MMP-A/EIS.

Chapter 2 Alternatives
Describes and compares the proposed management alternatives.

Chapter 3 Affected Environment
Presents the existing biological, physical, and socioeconomic resources that could be affected by implementing the management alternatives.

Chapter 4 Environmental Consequences
Evaluates the impacts of the alternatives on the human and natural environment in terms of environmental, social, and economic consequences projected to occur from implementing the alternatives.

Chapter 5 Consultation and Coordination
Describes the scoping and public comment process, agencies contacted, government-to-government consultation. Lists the preparers of the MMP-A/EIS.

Glossary
Provides definitions for important terms used in the MMP-A/EIS.

Index
Lists where significant issues, resource descriptions, NEPA terms, agencies, and groups discussed in the MMP-A/EIS are located.

Appendices
A Current Management: Grand Staircase-Escalante National Monument
B Current Management: Glen Canyon National Recreation Area
C Cultural Resources Management Protocol
D Forage Analysis Model
E Section 106 Programmatic Agreement

1.1 BACKGROUND

Public lands administered by the BLM are managed under land use plans, which require periodic updating. The BLM is required to "develop, maintain, and when appropriate, revise land use plans" (43 USC, Section 1712[a]). The BLM has determined that the existing Monument Management Plan**{** XE "Monument Management Plan, Grand Staircase-Escalante National Monument (MMP 2000)" **}** (MMP) needs to be revised and amended to integrate livestock grazing and rangeland management with the management of GSENM resources. In making these livestock grazing decisions, the BLM will consider objects identified in Presidential Proclamation 6920 of September 1996 and the principles of multiple use and sustained yield embodied in the FLPMA**{** XE "Federal Land Policy and Management Act (FLPMA)" **}** and the Taylor Grazing Act**{** XE "Taylor Grazing Act" **}**.

During the amendment process, the BLM will also consider new information or changed circumstances that were not known when the existing decisions were made. It recognizes that much has changed at the local, regional, and national levels since land use plan decisions for livestock grazing were prepared.

Livestock grazing in the southern Utah and northern Arizona area dates back to the 1860s. The number of cattle, sheep, and horses increased rapidly until the early 1900s and peaked in the early part of the twentieth century. With the passage of the Taylor Grazing Act{ XE "Taylor Grazing Act" } in 1934, the federal government established regulations pertaining to operators, allotments, kind and number of livestock, and season-of-use for livestock grazing on public land. During the late 1950s and early 1960s, the BLM completed range surveys to determine the capacity of the land for grazing. Because of these surveys, the BLM adjudicated decisions on forage and reduced livestock numbers on most allotments.

A federal court order on April 11, 1975, required the BLM to prepare additional grazing environmental analysis within the next ten years. To comply with this order, the BLM conducted range suitability analyses and field surveys on grazing capacity between 1975 and 1979. In 1980, based on the analysis conducted in the 1970s, the BLM reduced the level of livestock grazing use for resource protection by issuing the Kanab/Escalante Grazing Final Environmental Impact Statement, along with four management framework plans.

Livestock grazing in the planning area is managed according to land use plan decisions set by the Escalante, Paria, Vermilion, and Zion regional management framework plans (MFPs) signed in 1981 (BLM 1981a, 1981b, 1981c, and 1981d) and a subsequent plan amendment of the Escalante MFP completed in 1999 (BLM 1999). The planning area for the 1981 EISs included lands outside of the decision area for this MMP{ XE "Monument Management Plan, Grand Staircase-Escalante National Monument (MMP 2000)" }-A/EIS, including portions of the BLM's KFO and ASFO and NPS-managed lands in Glen Canyon.

In September 1996, GSENM was established by Presidential Proclamation 6920. It states, "Nothing in this proclamation shall be deemed to affect existing permits or leases for, or levels of, livestock grazing on Federal lands within the Monument; existing grazing uses shall continue to be governed by applicable laws and regulations other than this proclamation." The Proclamation directed the completion of an MMP{ XE "Monument Management Plan, Grand Staircase-Escalante National Monument (MMP 2000)" }, which was initiated in 1996.

In November 1999, the BLM approved the GSENM MMP{ XE "Monument Management Plan, Grand Staircase-Escalante National Monument (MMP 2000)" } and deferred land use-level decisions related to livestock grazing because "Monument designation does not affect existing permits or leases for, or levels of, livestock grazing" (BLM 2000, p. 4). The MMP continues, "…grazing will ultimately be addressed after the completion of assessments for each grazing allotment and the preparation of new allotment management plans{ XE "Allotment Management Plan" }."

The BLM included one specific grazing decision (GRAZ-1) in the MMP{ XE "Monument Management Plan, Grand Staircase-Escalante National Monument (MMP 2000)" } that described

a process for grazing management and included a schedule for completing the three-step process Monument-wide, as follows:

- An assessment
- A determination of rangeland health{ XE "Rangeland Health" } and evaluation of existing grazing management
- Development of allotment management plans{ XE "Allotment Management Plan" }

Steps 1 and 2 were completed in 2006, when the BLM issued rangeland health{ XE "Rangeland Health" } determinations. Step three of the process indicated that the allotment management plans{ XE "Allotment Management Plan" } would designate lands available for livestock grazing; the MMP{ XE "Monument Management Plan, Grand Staircase-Escalante National Monument (MMP 2000)" } did not identify lands available for livestock grazing use. Step 3 has not been completed, and GSENM continues to follow the livestock grazing decisions made in the 1981 management framework plans as amended.

In addition to the GRAZ-1 decision, more than 20 decisions in the MMP{ XE "Monument Management Plan, Grand Staircase-Escalante National Monument (MMP 2000)" } refer to livestock grazing or the allotment evaluation process. However, the MMP does not provide the land use plan level decisions needed to integrate livestock and rangeland management with the management of other GSENM resources. These decisions include identifying the lands available for livestock grazing, the amount of forage available for livestock, and possible grazing management practices, such as grazing systems, range improvements{ XE "Range Improvement" } (including land treatments), seasons of use, and stocking rates{ XE "Stocking Rate" }.

Livestock grazing decisions from the management framework plans are outdated. The following list describes relevant major changes in the planning area since the BLM prepared the last land use plan decisions for livestock grazing:

- Establishment of GSENM in 1996
- Establishment of the Utah BLM Standards for Rangeland Health{ XE "Rangeland Health" } and Guidelines for Livestock Grazing Management in 1997
- Issuance of the Glen Canyon Grazing Management Plan{ XE "Grazing Management Plan, Glen Canyon (GzMP 1999)" } (GzMP) in 1999
- Acquisition of approximately 175,000 acres of land within the GSENM boundary in 1998
- Issuance of the MMP{ XE "Monument Management Plan, Grand Staircase-Escalante National Monument (MMP 2000)" } in 1999
- Revision of NPS Management Policies in 2006
- Issuance of new policy and guidance for the National Landscape Conservation System in 2012
- Substantial and continuing increases in visitation to GSENM and the surrounding BLM- and NPS-managed lands

- Issuance of state and local plans, such as the Utah Grazing Agricultural Commodity Zones (updated 2015), Garfield County General Management Plan{ XE "General Management Plan, Glen Canyon (GMP 1979)" } (2007), the 1998 Kane County General and Resource Management Plans (as amended in 2014, 2015, and 2016), and Kane County Land Use Ordinance (Chapter 27-GSENM Multiple Use/Multiple Functions Grazing Zone; 2014)

Land use plan decisions provide the guidelines and criteria related to grazing management practices and levels of livestock grazing use. Land use plan decisions establish goals and objectives (i.e., desired outcomes) and the measures to achieve those goals and objectives (i.e., management actions and allowable uses). Allowable uses in land use plans identify the uses, or allocations, that are allowed, restricted, or prohibited on public lands. The BLM grazing regulations (43 CFR 4130.2[a]) direct grazing permits{ XE "Permit, Grazing" } or leases to be issued to qualified applicants. The permits authorize use on public lands and other lands under the administration of the BLM that are designated as available for livestock grazing through land use plans. This MMP{ XE "Monument Management Plan, Grand Staircase-Escalante National Monument (MMP 2000)" }-A designates lands available for livestock grazing.

The MMP{ XE "Monument Management Plan, Grand Staircase-Escalante National Monument (MMP 2000)" }-A process is limited to and results in land use plan decisions associated with livestock grazing. Management decisions for lands in the planning area but outside the GSENM boundary will be consistent with the goals and objectives of the KFO and ASFO Resource Management Plans (RMPs) and, for Glen Canyon, the NPS Organic Act of 1916 (54 USC, Section 100101). The NPS will make decisions for the Glen Canyon lands consistent with the NPS Organic Act. The NPS is responsible for making decisions related to lands in Glen Canyon. As a cooperating agency with jurisdiction by law, they have been involved in the process to ensure that the EIS is adequate for a decision to be made concerning lands in Glen Canyon.

1.2 Purpose and Need for the Plan Amendment

This MMP{ XE "Monument Management Plan, Grand Staircase-Escalante National Monument (MMP 2000)" }-A is needed to integrate livestock grazing and rangeland management into the existing MMP. It also provides for the comprehensive, science-based management of livestock grazing that enables multiple use/sustained yield of renewable resources by maintaining or improving land health. Land use plan decisions are needed to identify the lands available for livestock grazing, the amount of forage available for livestock, and possible grazing management practices, such as grazing systems, range improvements{ XE "Range Improvement" } (including land treatments), seasons of use, and stocking rates{ XE "Stocking Rate" } (BLM 2005).

Updated land use plan decisions for livestock grazing are also needed to incorporate new information and the many changes that have occurred since the 1980s. Livestock grazing decisions for GSENM must follow Proclamation 6920, which created the National Monument.

The purposes of this MMP{ XE "Monument Management Plan, Grand Staircase-Escalante National Monument (MMP 2000)" }-A are as follows:

- Establish goals and objectives for livestock grazing and rangeland management

- Establish broad-scale decisions that set the stage for site-specific implementation decisions, such as timing (season of use), duration (length of time), frequency of livestock grazing (how often), and magnitude (number of animal unit months (AUMs)) of livestock grazing
- Identify where grazing uses are allowed, restricted, or prohibited (i.e., available or unavailable for livestock grazing)
- Identify grazing management practices
- Provide the land use plan level decisions needed to integrate livestock and rangeland management with the management of GSENM objects and other resources.

For the decision area in Glen Canyon, the MMP{ XE "Monument Management Plan, Grand Staircase-Escalante National Monument (MMP 2000)" }-A ensures that the BLM's administration of grazing permits{ XE "Permit, Grazing" } protects the park resources and values{ XE "Resources and Values (Glen Canyon)" } of Glen Canyon in accordance with the NPS Organic Act of 1916 (54 USC, Section 100101). It provides that the BLM accomplish the goals and objectives defined in the 1979 Glen Canyon National Recreation Area General Management Plan{ XE "General Management Plan, Glen Canyon (GMP 1979)" } (GMP), the GzMP{ XE "Grazing Management Plan, Glen Canyon (GzMP 1999)" }, and other applicable land use plans. These goals and objectives are in place to protect park resources and to avoid unacceptable impacts or impairment.

The purposes for Glen Canyon are the same as those for GSENM, with decisions to be made by the NPS in accordance with applicable laws and policy.

1.3 Description of the Planning Area

The planning area encompasses approximately 2,316,100 acres in Garfield and Kane Counties, Utah, and Coconino County, Arizona. The planning area includes all BLM-managed lands in GSENM and BLM- and NPS-managed lands for which GSENM has livestock grazing administration responsibility. This includes lands in portions of the BLM's KFO and ASFO and NPS-managed lands in Glen Canyon.

The planning area is bordered on the west by Bryce Canyon National Park and the BLM KFO, on the north by Dixie National Forest, on the east by Capitol Reef National Park and Glen Canyon, and on the south by the BLM's KFO and ASFO, Utah State and Institutional Trust Lands, and Glen Canyon. Small areas of state, municipal, and private lands are contained within the planning area (see **Figure 1-2**, Planning Area).

The BLM's decision area for this planning effort is all of the BLM grazing lands that GSENM administers, including some lands in the BLM's KFO and ASFO; the NPS decision area is lands in Glen Canyon where GSENM administers grazing permits{ XE "Permit, Grazing" }. The decision area totals approximately 2,242,000 acres in the planning area but does not include state, municipal, or private lands, or small areas of BLM-managed land where no grazing decisions have previously been made or are being made in the MMP{ XE "Monument Management Plan, Grand Staircase-Escalante National Monument (MMP 2000)" }-A. **Table 1-1**, Land Status, shows acres by landowner or land management agency in the planning area and the decision area.

Table 1-1
Land Status

Landowner/Management Agency	Acres
Planning Area	
BLM	1,934,800
NPS	318,800
State	19,900
Private	42,600
Total	***2,316,100***
Decision Area	
BLM, GSENM	1,855,400
BLM, Kanab Field Office	65,500
BLM, Arizona Strip Field Office	2,300
NPS, Glen Canyon	318,800
Total	***2,242,000***

Source: BLM GIS 2014
Note: Acres have been rounded to the nearest 100.

There are 96 allotments in the decision area, 20 of which (approximately 318,800 acres) are wholly or partially in Glen Canyon (see **Figure 3-1**, Livestock Grazing Allotments). The BLM administers the permits on these allotments, in accordance with the enabling legislation for Glen Canyon and by means of a memorandum of understanding and interagency agreement between the BLM and the NPS.

Twenty allotments (65,500 acres) are wholly or partially in the BLM's KFO; the Sink Holes allotment (2,300 acres) is partially in the BLM's ASFO. GSENM has decision-making authority for allocation decisions related to these allotments and also administers the permits, in conformance with the land use plans for those offices. In other words, the only decisions in this

Figure 1-2 Planning Area

MMP{ XE "Monument Management Plan, Grand Staircase-Escalante National Monument (MMP 2000)" }-A that apply to the KFO and ASFO are the allocation decisions related to allotments that are available or unavailable for livestock grazing. The BLM Arizona Strip Field Office administers the Rock Reservoir and Coyote allotments in GSENM (see **Figure 3-1**, Livestock Grazing Allotments).

1.3.1 Livestock Grazing Administration in Glen Canyon

In 1972, Congress passed Glen Canyon's enabling legislation (Public Law 92-593). It created the recreation area as a unit of the National Park System, managed by the NPS in accordance with the 1916 NPS Organic Act. The purpose of the recreation area, as described in the enabling legislation, is "to provide public outdoor recreation use and enjoyment of Lake Powell and lands adjacent thereto…and to preserve and protect the scenic, scientific, and historic features contributing to public enjoyment of the area."

The GzMP{ XE "Grazing Management Plan, Glen Canyon (GzMP 1999)" } specifically identified the following values and purposes: vegetation, soils, wildlife, water quality, cultural resources (historic and prehistoric), scenic resources, recreation, and paleontology. Grazing, although not a purpose of the recreation area, is a use recognized by Congress in Glen Canyon's enabling legislation. It specifies that the BLM should administer grazing permits{ XE "Permit, Grazing" }, which it does through four offices. One of these offices is GSENM, which includes grazing on a portion of the recreation area.

GSENM applies BLM policies for issuing and administering grazing permits{ XE "Permit, Grazing" }, such as the 1934 Taylor Grazing Act{ XE "Taylor Grazing Act" } (43 USC, Section 315 et seq.) and, on BLM-administered lands, the FLPMA{ XE "Federal Land Policy and Management Act (FLPMA)" } (43 USC, Section 1701 et seq.). In addition, GSENM administration of grazing allotments in Glen Canyon is subject to Glen Canyon's enabling legislation. Public Law 92-593 states, "…the Secretary shall administer, protect, and develop the recreation area in accordance with the provisions of the [Organic] Act of August 25, 1916 (54 USC, Section 100101 et seq.), as amended and supplemented, and with other statutory authority available to him for conservation and management of natural resources to the extent he finds such authority will further the purpose of this Act." The Redwood National Park Expansion Act of March 27, 1978 (Redwood Amendment), states that in areas of the National Park System, "The authorization of activities...shall not be exercised in derogation of the values and purposes for which these various areas have been established."

On September 4, 1984, to foster coordination between the two agencies, the directors of the BLM and the NPS signed an umbrella memorandum of understanding for grazing administration in units of the NPS where grazing is authorized. To implement this memorandum of understanding, an interagency agreement was executed in 1993 between Glen Canyon and both the BLM Utah and Arizona state offices. The interagency agreement was reaffirmed most recently in 2015 (Interagency Agreement 1440-3-0001). The intent of this agreement is to "conduct a program to coordinate grazing administration activities on [Glen Canyon] which shall be carried out by the respective BLM District Managers of the Arizona Strip, Cedar City, Richfield, and Moab Districts...and in coordination and cooperation with the Superintendent of [Glen Canyon]." This agreement states that the "BLM has expertise in developing, implementing,

and analyzing grazing programs" and that "NPS has expertise in determining whether an activity is consistent with the values and purposes of [Glen Canyon]."

In accordance with the 1984 umbrella memorandum of understanding, until the Superintendent of Glen Canyon has determined the potential effects of the proposed action on the values and purposes of Glen Canyon (i.e., a values and purposes determination), the BLM will not engage in any of the following:

- Act on any grazing authorizations, range developments, management plans, management agreements, or resource monitoring and evaluation
- Approve or act on a change in a grazing permit{ XE "Permit, Grazing" }
- Change the kind of livestock or the season of use
- Implement new construction, reconstruction, or major maintenance of existing range developments or improvements
- Institute a new or modified allotment management plan{ XE "Allotment Management Plan" }, grazing system, or resource monitoring or evaluation not covered by an agreed-on plan

The values and purposes determination processes are to ensure that grazing activities are consistent with the values and purposes of resources, as called for in the 1916 NPS Organic Act and the Glen Canyon GMP{ XE "General Management Plan, Glen Canyon (GMP 1979)" } (NPS 1979). The determinations consider protecting resource values and their relationship to public use and enjoyment of the area.

To give further clarity to the Glen Canyon values and purposes, with respect to grazing practices across the recreation area, a grazing component (the GzMP{ XE "Grazing Management Plan, Glen Canyon (GzMP 1999)" }) of the GMP{ XE "General Management Plan, Glen Canyon (GMP 1979)" } was developed and signed in 1999 (NPS 1999). This plan was to be a foundational document to give management direction for the future of grazing practices across the recreation area. It was made to be flexible, allowing new data and methods to be incorporated into the determinations of park values and resource conditions and the management of livestock practices.

The 1999 GzMP{ XE "Grazing Management Plan, Glen Canyon (GzMP 1999)" } identifies specific value statements for each fundamental recreation area resource in the context of livestock grazing. Resource management goals and 34 resource objectives were also developed with input from local BLM offices. This was done to comply with the intent of the NPS Organic Act and Glen Canyon's enabling legislation and to help achieve each resource value. It is against these 34 objectives that approval of any proposed grazing activity across the recreation area is based.

Grazing in Glen Canyon is managed under the 1999 GzMP{ XE "Grazing Management Plan, Glen Canyon (GzMP 1999)" } (NPS 1999). The BLM will apply the goals, objectives, and recommendations for grazing practices and management actions identified in this plan to all alternatives for NPS-managed lands. This will ensure protection of park resources and values{ XE "Resources and Values (Glen Canyon)" }, as defined by the NPS. This plan also provides a

means to evaluate and make appropriate revisions to the GzMP within the Glen Canyon portion of the planning area.

1.4 PLANNING PROCESS

The process for developing, approving, maintaining, and amending the MMP{ XE "Monument Management Plan, Grand Staircase-Escalante National Monument (MMP 2000)" }-A is conducted under the authority of Section 202(f) of FLPMA{ XE "Federal Land Policy and Management Act (FLPMA)" } and Section 202(c) of NEPA{ XE "National Environmental Policy Act (NEPA)" }. The process is guided by BLM planning regulations codified in 43 CFR, Part 1600, and CEQ{ XE "Council on Environmental Quality (CEQ)" } regulations codified in 40 CFR, Part 1500. It has two levels: land use planning and implementation.

During land use planning, the BLM develops a plan that prescribes the allocation of and general future management direction for grazing in the decision area. The land use plan then guides the implementation level, which includes site-specific implementation planning and daily operations. In this case, the BLM is developing an amendment to the MMP{ XE "Monument Management Plan, Grand Staircase-Escalante National Monument (MMP 2000)" } for planning level decisions related to livestock grazing.

Activity or implementation planning is based on the broad-scale grazing land use decisions from the MMP{ XE "Monument Management Plan, Grand Staircase-Escalante National Monument (MMP 2000)" }-A. This is done for site-specific implementation decisions for grazing applicable to smaller geographic units of BLM-administered land in the decision area. Implementation decisions identified in the implementation plan require additional planning and NEPA{ XE "National Environmental Policy Act (NEPA)" } analysis, based on site-specific conditions. Implementation includes such actions as approving site-specific range improvements{ XE "Range Improvement" }, developing allotment management plans{ XE "Allotment Management Plan" }, and issuing grazing permits{ XE "Permit, Grazing" }. Implementation planning can also identify specific mitigation needs or the need to develop and implement additional implementation plans and actions in other parts of the decision area.

As part of this MMP{ XE "Monument Management Plan, Grand Staircase-Escalante National Monument (MMP 2000)" }-A process, published documents will include a draft MMP-A/EIS, a proposed MMP-A/EIS, and an approved MMP-A/Record of Decision (ROD). Publication of the draft MMP-A/EIS will initiate a 90-day public comment period; publication of the proposed MMP-A/EIS will trigger a 30-day public protest period for BLM decisions; there is no protest period for NPS decisions.

1.5 PUBLIC AND AGENCY COORDINATION

1.5.1 Agency Coordination

The benefits of enhanced collaboration among agencies in preparing NEPA{ XE "National Environmental Policy Act (NEPA)" } analyses are the following:

- Disclosing relevant information early in the analytical process
- Applying available technical expertise and staff support

- Promoting consistency with other federal, state, tribal, and local procedures
- Establishing a mechanism for addressing intergovernmental issues

Additional information regarding collaboration with governments, agencies, and tribal representatives is provided in **Chapter 5**, Consultation and Coordination.

1.5.2 Scoping{ XE "Scoping" }

Scoping{ XE "Scoping" }, as required by 40 CFR 1501.7, is an early and open process for determining the scope of issues to be addressed and identifying the significant issues related to a proposed action. Information collected during scoping may also be used to develop the alternatives to be addressed in an EIS. The process has two components: internal scoping and external scoping.

Internal scoping is conducted within the BLM and cooperating agencies to help determine what needs to be analyzed in the EIS. It is used to define issues, alternatives, and data needs. It may also be used for the following purposes (BLM 2008a):

- To formulate and refine the purpose and need
- To identify any connected, cumulative, or similar actions associated with the proposal
- To start preparation for cumulative effects analysis
- To decide the appropriate level of NEPA{ XE "National Environmental Policy Act (NEPA)" } documentation (i.e., an environmental assessment or an EIS)
- To develop a public involvement strategy
- To decide other features of the NEPA{ XE "National Environmental Policy Act (NEPA)" } process

External scoping involves notification of and opportunities for feedback from other agencies, organizations, tribes, local governments, and the public. It can be used for the following purposes:

- To identify coordination needs with other agencies
- To refine issues through feedback on preliminary issues
- To identify new issues and possible alternative
- To begin identifying past, present, and reasonably foreseeable actions by others that could have a cumulative effect together with the BLM action

The intent of scoping is to focus the analysis on significant issues and reasonable alternatives, to eliminate extraneous discussion, and to reduce the length of the EIS (BLM 2008a).

While CEQ{ XE "Council on Environmental Quality (CEQ)" } regulations do not provide a standard duration for scoping periods, BLM land use planning guidance requires a minimum 30-day formal scoping period (BLM 2005). Formal public scoping begins following the publication of

a Notice of Intent in the *Federal Register*. Informal internal and external scoping may occur before the formal public scoping period begins.

According to 43 CFR 1610.2(d), the BLM shall document public participation activities by a record or summary of the principal issues discussed and comments made. To satisfy this requirement for scoping, the BLM's NEPA{ XE "National Environmental Policy Act (NEPA)" } guidance (BLM 2008a) requires the preparation of a scoping report. In this report are discussions of the issues raised during the scoping process, the issues to be addressed in the EIS, the issues that will not be addressed in the EIS and why, a list of participants in the scoping process, and the views of those participants.

The BLM published a Notice of Intent to prepare the GSENM Livestock Grazing MMP{ XE "Monument Management Plan, Grand Staircase-Escalante National Monument (MMP 2000)" }-A/EIS on November 4, 2013 (78 Federal Register 66064-66065). This initiated the formal public scoping period, which ended on January 13, 2014, 30 days after the last public scoping meeting. The public scoping period lasted 70 days, more than double the minimum required for BLM land use planning. The BLM published a public scoping report on the project website (https://eplanning.blm.gov/epl-front-office/eplanning/planAndProjectSite.do?methodName=renderDefaultPlanOrProjectSite&projectId=69026). In addition to the comments documented in the scoping report, the BLM will consider all comments received during the planning process when developing the MMP-A.

Public scoping activities included the following:

- The BLM created and is maintaining a project website (https://eplanning.blm.gov/epl-front-office/eplanning/planAndProjectSite.do?methodName=renderDefaultPlanOrProjectSite&projectId=69026) to keep the public informed about the MMP{ XE "Monument Management Plan, Grand Staircase-Escalante National Monument (MMP 2000)" }-A/EIS process.
- In November 2013, the BLM mailed a newsletter, announcing the public scoping period, to more than 350 individuals, agencies, and organizations. It provided project background information, the dates and venues for three scoping meetings, decisions to be made, a planning timeline, preliminary planning criteria{ XE "Planning Criteria" } and planning issues{ XE "Planning Issues" }, and a description of the various methods for submitting comments, including dedicated e-mail and postal mail addresses.
- The BLM sent a press release announcing the scoping period to local media outlets and posted it on the project website on November 1, 2013. The press release provided the dates and locations of the scoping meetings and described the various methods for submitting comments. The press release was published on KCSG Television's website on November 1, 2013, in the Wayne & Garfield County Insider on December 5, 2013, and in Deseret News on December 6, 2013. Additionally, "The County Seat," a television program, ran a piece explaining the planning and the implications of changes to grazing on ranchers and counties.

- The BLM hosted three scoping meetings to provide the public with opportunities to become involved, to learn about the project and the planning process, to meet the GSENM MMP{ XE "Monument Management Plan, Grand Staircase-Escalante National Monument (MMP 2000)" }-A/EIS team members, and to offer comments. The meetings occurred on December 10, 11, and 12, 2013, in Kanab, Escalante, and Salt Lake City, Utah. The meetings were advertised via press release, the project newsletter, the project website, and phone calls from BLM staff to potentially interested grazing permit{ XE "Permit, Grazing" }tees.
- The NPS and BLM participated in open houses to share information on the GSENM MMP{ XE "Monument Management Plan, Grand Staircase-Escalante National Monument (MMP 2000)" }-A and other NPS planning in Page, Arizona, and Blanding, Escalante, Kanab, and Salt Lake City, Utah, in February 2014.
- The BLM received 564 written submissions during the public scoping period, comprising 205 separate submissions, and 1 form letter. Most written submissions included more than one comment, so the 564 submissions (including form letters) yielded 1,287 discrete comments. Detailed information about the comments received and about the public outreach process can be found in the GSENM Scoping{ XE "Scoping" } Report, available on the project website (https://eplanning.blm.gov/epl-front-office/eplanning/planAndProjectSite.do?methodName=renderDefaultPlanOrProjectSite&projectId=69026).

Issue Identification

Issue identification is the first step of the nine-step BLM planning process. A planning issue is a major controversy or dispute regarding management of resources or uses on BLM-administered lands that can be addressed in a variety of ways, which is within the BLM's authority to resolve. Planning issues{ XE "Planning Issues" } provide the major focus for development of alternatives.

Issues Addressed

The BLM identified preliminary planning issues{ XE "Planning Issues" } in the Notice of Intent. Based on public comments and further agency coordination, the BLM modified the preliminary planning issues and identified additional issues to be addressed in the MMP{ XE "Monument Management Plan, Grand Staircase-Escalante National Monument (MMP 2000)" }-A/EIS. Both sets of issues are presented in **Table 1-2**, Planning Issues.

Table 1-2
Planning Issues{ XE "Planning Issues" }

Preliminary Planning Issues{ XE "Planning Issues" **} in NOI**	**Modified and Additional Planning Issues{ XE** "Planning Issues" **} After Public Comments and Agency Coordination**
Effects on GSENM Proclamation-identified scientific and historical objects	Effects of livestock grazing management on GSENM Proclamation-identified scientific and historical objects
Lands available for livestock grazing within	Lands available for livestock grazing in the

Table 1-2
Planning Issues{ XE "Planning Issues" }

Preliminary Planning Issues{ XE "Planning Issues" **} in NOI**	**Modified and Additional Planning Issues{ XE** "Planning Issues" **} After Public Comments and Agency Coordination**
the planning area	decision area
Effects on the resources and values{ XE "Resources and Values (Glen Canyon)" } for which Glen Canyon was established	Effects of livestock grazing management on the resources and values{ XE "Resources and Values (Glen Canyon)" } for which Glen Canyon was established (e.g., public outdoor recreation use and enjoyment and scenic, scientific, and historical features)
Forage{ XE "Forage" } currently available on an area-wide basis for livestock grazing and available for future anticipated demands	Forage{ XE "Forage" } currently available on an area-wide basis for livestock grazing and available for future anticipated demands
Guidelines and criteria for future allotment-specific adjustments, such as rotational grazing plans, that affect livestock use	Guidelines and criteria for future allotment-specific adjustments, such as the amount of forage available for livestock, season of use, or other grazing management practices
Impacts on local custom and culture{ XE "Custom and Culture" } and the area's economy	Effects of livestock grazing management on local custom and culture{ XE "Custom and Culture" } Effects of livestock grazing management on the area's economy
Management of existing rangeland improvement seedings{ XE "Seeding" }	Management of existing range improvement{ XE "Range Improvement" } seedings{ XE "Seeding" } and opportunities for future range improvements
No similar issue	Effects of livestock grazing management on vegetation, including riparian vegetation
No similar issue	Effects of livestock grazing management on soils, including biological soil crusts{ XE "Biological Soil Crust" }
No similar issue	Effects of climate change and drought on forage availability
No similar issue	Effects of livestock grazing management on recreation
No similar issue	Effects of livestock grazing on cultural resources

Issues Considered but Not Further Analyzed

Approximately 10 percent of the comments received during the public scoping period concerned issues that are not addressed in this MMP{ XE "Monument Management Plan, Grand Staircase-Escalante National Monument (MMP 2000)" }-A. These are as follows:

- Implementation decisions that the BLM has already addressed or implementation of the MMP{ XE "Monument Management Plan, Grand Staircase-Escalante National Monument (MMP 2000)" }-A, including requests for allotment-specific improvements (such as requests for treatments and structures), suggestions for removing improvements or other items (e.g., fencing, barrels, trash, trash dumps, and stock tanks), requests for additional facilities and signage at recreation areas, and requests that water improvements be retrofitted to meet visual resource management objectives; Other comments concerned feral and trespass cattle, permit renewals, and operator compliance with permits.
- Issues to be addressed through policy or administrative action, including comments pertained to grazing permit{ XE "Permit, Grazing" } costs, potential issues with subleasing permits, allowing fluid minerals development, firing or hiring BLM staff, and making allotment contracts and reporting documents available online.
- Issues that the BLM has addressed but should be better communicated to those who raised the issues, such as reopening a road to the Wahweap Hoodoos, general comments about closing additional routes or restricting OHV{ XE "Off-Highway Vehicle (OHV)" } use, and making routes available for administrative use by grazing permit{ XE "Permit, Grazing" }tees.
- Comments related to laws, regulations, and guidance.
- Issues beyond the scope of the MMP{ XE "Monument Management Plan, Grand Staircase-Escalante National Monument (MMP 2000)" }-A, such as comments about land management on areas outside the planning area and comments on issues for which the BLM has limited or no administrative authority, such as hunting, which is regulated by the Utah Division of Wildlife.

Specific comments and issues considered but not further analyzed are provided in the scoping report on the project website (https://eplanning.blm.gov/epl-front-office/eplanning/planAndProjectSite.do?methodName=renderDefaultPlanOrProjectSite&projectId=69026).

1.5.3 Planning Criteria{ XE "Planning Criteria" }

During its initial planning sessions and internal scoping, GSENM staff developed preliminary planning criteria{ XE "Planning Criteria" }, which establish limitations, guidelines, and standards for the planning process. Planning criteria define the scope of the amendment process and estimate the extent of data collection and analysis. These criteria are based on standards prescribed by applicable laws and regulations, agency guidance, results of consultation and coordination with the public and other federal, state, and local agencies, analysis of information pertinent to the planning area, and professional judgment. The BLM may change planning criteria as a result of public input, as issues are addressed, or as new information is presented.

The BLM identified preliminary planning criteria{ XE "Planning Criteria" } in the Notice of Intent. Based on public comments and further agency coordination, the BLM modified the preliminary planning criteria for use in preparing the Draft MMP{ XE "Monument Management Plan, Grand Staircase-Escalante National Monument (MMP 2000)" }-A/EIS. Both sets of criteria are presented in **Table 1-3**, Planning Criteria.

Table 1-3
Planning Criteria{ XE "Planning Criteria" }

Preliminary Planning Criteria{ XE "Planning Criteria" **} in NOI**	**Modified Planning Criteria{ XE** "Planning Criteria" **} After Public Comments and Agency Coordination**
The MMP-{ XE "Monument Management Plan, Grand Staircase-Escalante National Monument (MMP 2000)" }A will be limited to making land use plan-level decisions specific to livestock grazing.	The BLM will limit the scope of the MMP-{ XE "Monument Management Plan, Grand Staircase-Escalante National Monument (MMP 2000)" }A to making land use-level planning decisions specific to livestock grazing.
Lands addressed in the EIS will be those managed by the BLM and the NPS.	This MMP-{ XE "Monument Management Plan, Grand Staircase-Escalante National Monument (MMP 2000)" }A will address BLM- and NPS-managed lands, where GSENM administers grazing permits{ XE "Permit, Grazing" }.
Grazing within Glen Canyon will be administered to protect its values and purposes, in accordance with Public Law 92-593 and the 1916 NPS Organic Act.	The BLM and NPS will administer grazing in Glen Canyon to protect its values and purposes, in accordance with Public Law 92-593 and the 1916 NPS Organic Act.
The process must use the Utah BLM Standards for Rangeland Health{ XE "Rangeland Health" } and Guidelines for Livestock Grazing Management. The BLM will apply existing applicable land health standards to all alternatives.	The BLM will use the Utah BLM Standards for Rangeland Health{ XE "Rangeland Health" } and Guidelines for Livestock Grazing Management (BLM 1997) and will apply existing land health standards to all alternatives.[1]
The approved MMP{ XE "Monument Management Plan, Grand Staircase-Escalante National Monument (MMP 2000)" }-A will comply with the FLPMA{ XE "Federal Land Policy and Management Act (FLPMA)" }, NEPA{ XE "National Environmental Policy Act (NEPA)" }, the National Historic Preservation Act{ XE "National Historic Preservation Act (NHPA)" }, CEQ{ XE "Council on Environmental Quality (CEQ)" } regulations at 40 CFR, Parts 1500-1508, Department of the Interior regulations at 43 CFR, Parts 46 and 1600, the BLM's Land Use Planning Handbook (BLM 2005), its 2008 NEPA Handbook (BLM 2008a), and all other applicable BLM policies and guidance.	The approved MMP{ XE "Monument Management Plan, Grand Staircase-Escalante National Monument (MMP 2000)" }-A will comply with the FLPMA{ XE "Federal Land Policy and Management Act (FLPMA)" }, NEPA{ XE "National Environmental Policy Act (NEPA)" }, National Historic Preservation Act{ XE "National Historic Preservation Act (NHPA)" }, and CEQ{ XE "Council on Environmental Quality (CEQ)" } regulations at 40 CFR, Parts 1500-1508. The approved MMP{ XE "Monument Management Plan, Grand Staircase-Escalante National Monument (MMP 2000)" }-A will comply with 43 CFR, Part 1600, 43 CFR, Part 4100, the BLM Land Use Planning Handbook (BLM 2005), the 2008 BLM NEPA{ XE "National Environmental Policy Act (NEPA)" } Handbook (BLM 2008a), and other applicable BLM regulations, policies, and guidance. Land use planning decisions for Glen Canyon will

[1] The Utah BLM Standards of Rangeland Health{ XE "Rangeland Health" } also apply to the portion of the ASFO where GSENM administers livestock grazing.

Table I-3
Planning Criteria{ XE "Planning Criteria" }

Preliminary Planning Criteria{ XE "Planning Criteria" **} in NOI**	**Modified Planning Criteria{ XE** "Planning Criteria" **} After Public Comments and Agency Coordination**
	comply with applicable NPS management policies, director's orders, and reference manuals.
Land use planning decisions must be consistent with the purpose and objectives outlined in the presidential proclamation for GSENM and the enabling legislation for Glen Canyon, as applicable.	Land use planning decisions must be consistent with the Presidential Proclamation for GSENM and with the enabling legislation for Glen Canyon. For NPS-managed lands, the BLM will apply to all alternatives the goals, objectives, and recommendations for grazing and management identified in the 1999 GzMP{ XE "Grazing Management Plan, Glen Canyon (GzMP 1999)" } for Glen Canyon; this is to ensure protection of park resources and values{ XE "Resources and Values (Glen Canyon)" }, as defined by the NPS. Any proposed updates or revisions to the GzMP goals, objectives, and recommendations for grazing management identified in this MMP{ XE "Monument Management Plan, Grand Staircase-Escalante National Monument (MMP 2000)" }-A will be specifically identified and described by alternative.
The socioeconomic analysis will use an accepted input-output quantitative model, such as Impact Analysis for Planning (IMPLAN) or Regional Input Output Modeling System (RIMS II), and Jobs and Economic Development Impact (JEDI) for analysis.	The BLM will use an accepted input-output quantitative model, such as IMPLAN, for socioeconomic analysis.
The BLM and NPS will use current scientific information, research, technologies, and results of inventorying, monitoring, and coordinating to determine appropriate management strategies.	The BLM and NPS will review and use as appropriate current scientific information, research, technologies, and results of inventorying, monitoring, and coordinating to inform management strategies. The use of scientific and scholarly information will be consistent with Department of Interior Manual 305 DM 3.
The BLM and NPS will coordinate and communicate with federal, state, local, and tribal governments to ensure that the BLM and the NPS consider provisions of pertinent plans, seek to resolve inconsistencies between federal, state, local, and tribal plans, and provide ample opportunities for federal, state, local, and tribal governments to comment on the development of the EIS.	The BLM and NPS will coordinate and communicate with federal, state, local, and tribal governments to ensure that the BLM and NPS consider the provisions of pertinent plans and that it seek to resolve inconsistencies between federal, state, local, and tribal plans. The BLM and NPS will also provide ample opportunities for federal, state, local, and tribal governments to comment on amendment development.
The MMP-{ XE "Monument Management Plan,	The BLM and NPS will base the MMP-{ XE

Table 1-3
Planning Criteria{ XE "Planning Criteria" }

Preliminary Planning Criteria{ XE "Planning Criteria" **} in NOI**	**Modified Planning Criteria{ XE** "Planning Criteria" **} After Public Comments and Agency Coordination**
Grand Staircase-Escalante National Monument (MMP 2000)" }A will be based on the principles of adaptive management.	"Monument Management Plan, Grand Staircase-Escalante National Monument (MMP 2000)" }A on the principles of adaptive management.

1.5.4 Legislative Constraints

The FLPMA{ XE "Federal Land Policy and Management Act (FLPMA)" } is the primary authority for the BLM to manage public lands; it does not apply to NPS-managed lands. This law establishes provisions for land use planning, land acquisition and disposition, administration, rangeland management, rights-of-way, and designated management areas and the repeal of certain laws and statutes. NEPA{ XE "National Environmental Policy Act (NEPA)" } requires the consideration and public availability of information on the environmental impacts of major federal actions significantly affecting the quality of the human environment.

All management direction and actions developed as part of the BLM planning process are subject to valid existing rights and must meet the objectives of the BLM's multiple-use management mandate and responsibilities (FLPMA{ XE "Federal Land Policy and Management Act (FLPMA)" } Section 202[c] and [e]). Valid existing rights are those in existence within the boundaries of GSENM when it was established on September 18, 1996. These may include rights associated with oil and gas leases, mineral leases, mining claims, and certain lands and realty actions. In addition, as discussed in **Section 1.6.1**, grazing uses authorized by the permits or leases in effect on September 18, 1996, and range improvements{ XE "Range Improvement" } that were authorized at that time, are to be managed by those laws and regulations that govern grazing on public land. Examples are the FLPMA, the Taylor Grazing Act{ XE "Taylor Grazing Act" }, and Fundamentals of Rangeland Health{ XE "Rangeland Health" } regulations (43 CFR, Part 4180). Current BLM policy does not allow it to consider as valid existing rights any Revised Statute 2477 claims that have not been adjudicated.

In addition, several other federal laws give direction and authority to the BLM. The following are some of the federal laws that direct the management of public lands and resources in the decision area:

- Antiquities Act of 1906
- Migratory Bird Treaty Act of 1929
- Bald and Golden Eagle Protection Act of 1940, as amended
- National Historic Preservation Act{ XE "National Historic Preservation Act (NHPA)" } of 1966 (Public Law 89-655; 80 Stat. 915)
- NEPA{ XE "National Environmental Policy Act (NEPA)" } (Public Law 90-190)
- Clean Air Act of 1970 (42 USC, Section 7401 et seq.)

- Endangered Species Act{ XE "Endangered Species Act (ESA)" } of 1973, as amended (Public Law 93-205; 87 Stat. 884; 16 USC Section 1531-1543)
- Public Rangelands Improvement Act of 1978 (43 USC Section 1901-1908)
- American Indian Religious Freedom Act of 1978 (Public Law 95-341; 42 USC, Section 1996)
- Archaeological Resources Protection Act of 1979 (Public Law 96-95; 16 USC, Section 470aa, et seq.)
- Arizona Wilderness Act of 1984 (Public Law 98-406) establishing the Paria Canyon-Vermilion Cliffs Wilderness
- Native American Graves Protection and Repatriation Act of 1990 (Public Law 101-601; 25 USC, Section 3001, et seq.)
- Appendix A of the Committee on Interior and Insular Affairs of the House of Representatives accompanying HR 2570 of the 101st Congress (commonly called the Congressional Wilderness Grazing Guidelines; February 21, 1990)
- Paleontological Resources Protection Act of 2009
- CEQ{ XE "Council on Environmental Quality (CEQ)" } regulations (40 CFR, Parts 1500-1508)
- FLPMA{ XE "Federal Land Policy and Management Act (FLPMA)" } (Public Law 94-579)
- Omnibus Public Land Management Act of 2009
- Presidential Proclamation 6920 to established GSENM
- BLM Resources management planning regulations (43 CFR, Part 1610)
- NPS Organic Act of 1916 (54 USC, Section 100101)
- Redwood National Park Act of 1968, as amended (Public Law 90-545)
- Legislation establishing Glen Canyon (Public Law 92-593)
- National Park System General Authorities Act, as amended (54 USC, Section 100101)

1.6 Relationship to Laws and Agency Regulations, Policies, and Programs

1.6.1 BLM

GSENM Proclamation and Objects{ XE "Objects (GSENM)" }

GSENM was established by President Bill Clinton on September 18, 1996. President Clinton exercised his authority under the Antiquities Act of 1906 and signed a proclamation designating objects of historic or scientific interest that he determined to warrant protection. He withdrew and reserved the public lands in the National Monument for the care and management of those objects. The BLM is obligated under the Antiquities Act of 1906 and the Proclamation to manage these public lands to protect the objects.

The President, however, made clear that the BLM has no additional obligation with regard to existing grazing uses than it did before the area was designated as a National Monument. In particular, the Proclamation specifically addresses grazing use in the following provision:

> *Nothing in this proclamation shall be deemed to affect existing permits or leases for, or levels of, livestock grazing on Federal lands within the monument; existing grazing uses shall continue to be governed by applicable laws and regulations other than this proclamation.*

The "existing permits or leases" and "existing grazing uses" are those in place when the President signed the Proclamation. Consequently, grazing uses authorized by the permits or leases in effect on September 18, 1996, and range improvements{ XE "Range Improvement" } that were authorized at that time, are to be managed by those laws and regulations that govern grazing on public land, such as the FLPMA{ XE "Federal Land Policy and Management Act (FLPMA)" }, the Taylor Grazing Act{ XE "Taylor Grazing Act" }, and Fundamentals of Rangeland Health{ XE "Rangeland Health" } regulations (43 CFR, Part 4180).

In contrast, the BLM must, under the Antiquities Act and the Proclamation, manage new grazing use or range improvements{ XE "Range Improvement" } that were not authorized in 1996 to protect monument objects within GSENM.

Notwithstanding that the BLM is not obligated under the Antiquities Act to manage the grazing use that existed in 1996, it has discretion under the FLPMA{ XE "Federal Land Policy and Management Act (FLPMA)" }, the Taylor Grazing Act{ XE "Taylor Grazing Act" }, and related laws and regulations to manage such grazing use, consistent with the principles of multiple use and sustained yield. This would protect resources even if they have been identified as monument objects. In other words, the BLM may manage grazing use to minimize the impact on those resources in the same way that it may manage grazing use to minimize the impact on resources or uses not identified in the Proclamation. Under the FLPMA, the Taylor Grazing Act, and other applicable authorities, the BLM may manage grazing use—even the use that existed in 1996—to protect resources identified as monument objects even though it has no legal obligation to do so.

The MMP{ XE "Monument Management Plan, Grand Staircase-Escalante National Monument (MMP 2000)" }-A/EIS Amendment will disclose the effects of grazing on monument objects and other resources under a full range of options for grazing management.

Livestock Grazing Administration and Planning

43 CFR, Part 4100, Grazing Administration

The BLM administers livestock grazing on lands it manages in the continental United States under 43 CFR, Part 4100. Statutory authority for these regulations are the following:

- The Taylor Grazing Act{ XE "Taylor Grazing Act" }, as amended (43 USC 315a through 315r)

- FLPMA{ XE "Federal Land Policy and Management Act (FLPMA)" } (43 USC, Section 1701 et seq.) as amended by the Public Rangelands Improvement Act{ XE "Public Rangelands Improvements Act" } (43 USC, Section 1901 et seq.)
- Public Rangelands Improvement Act of 1978 (43 USC Section 1901-1908)
- Section 4 of the Oregon and California Railroad Lands Act (43 USC 1181d)
- Executive orders that transfer land acquired under the Bankhead-Jones Farm Tenant Act (7 USC 1012) to the Secretary of the Interior and authorize administration under the Taylor Grazing Act{ XE "Taylor Grazing Act" }
- Public land orders, executive orders, and agreements authorizing the Secretary of the Interior to administer livestock grazing on specified lands under the Taylor Grazing Act{ XE "Taylor Grazing Act" } or on other lands as specified

The purpose of 43 CFR, Part 4100, is to provide uniform guidance for administration of grazing on public lands, exclusive of Alaska. The objectives of these regulations are as follows:

- To promote healthy sustainable rangeland ecosystems
- To accelerate restoration and improvement of public rangelands to properly functioning conditions
- To promote the orderly use, improvement, and development of the public lands
- To establish efficient and effective administration of grazing of public rangelands
- To provide for the sustainability of the western livestock industry and communities that depend on productive, healthy public rangelands

These objectives will be consistent with land use plans, multiple use, sustained yield, environmental values, economic, and other objectives stated in 43 CFR 1720 and 1725, the Taylor Grazing Act{ XE "Taylor Grazing Act" } of June 28, 1934, as amended (43 USC 315, 315a-315r) and Section 102 of FLPMA{ XE "Federal Land Policy and Management Act (FLPMA)" } (43 USC 1740).

In accordance with 43 CFR 4100.0-8, the BLM Authorized Officer "shall manage livestock grazing on public lands under the principle of multiple use and sustained yield, and in accordance with applicable land use plans. Land use plans shall establish allowable resource uses (either singly or in combination), related levels of production or use to be maintained, areas of use, and resource condition goals and objectives to be obtained. The plans also set forth program constraints and general management practices needed to achieve management objectives."

The plans also set forth program constraints and general management practices needed to achieve management objectives. Livestock grazing and management approved by the BLM Authorized Officer will conform to the land use plan, as defined at 43 CFR 1601.0- 5(b).

BLM Fundamentals of Rangeland Health{ XE "Rangeland Health" } and Standards and Guidelines for Grazing Administration (43 CFR, Part 4180)

The four fundamentals of rangeland health{ XE "Range Land Health, Fundamental of" } are the basic ecological principles underlying sustainable production of rangeland resources. They serve as the basis for the Standards and Guidelines for Grazing Management.

Utah BLM Standards for Rangeland Health{ XE "Rangeland Health" } and Guidelines for Livestock Grazing Management (BLM 1997)

These standards and guidelines were developed in accordance with 43 CFR, Part 4180, to provide for conformance with the Fundamentals of Rangeland Health{ XE "Rangeland Health" } (above). Through conformance and attainment of Utah's Standards and Guidelines, the Utah BLM ensures that the Fundamentals of Rangeland Health are met. Standards of land health are expressions of levels of physical and biological condition or degree of function required for healthy lands and sustainable uses, and define minimum resource conditions that must be achieved and maintained. Desired conditions may be a higher level than the minimum required for ecosystem component function. Guidelines are the grazing management approaches, methods, and practices that are intended to achieve a standard.

Manual 4100, Grazing Administration (BLM 2009)

This manual sets forth the objectives, responsibilities, and policies for livestock grazing on BLM-managed lands, exclusive of Alaska.

Handbook H-4120-1, Grazing Management (BLM 1987)

This handbook describes cooperative management agreements, allotment management plans{ XE "Allotment Management Plan" }, range improvements{ XE "Range Improvement" }, government agency cooperation, and special rules as they pertain to livestock grazing on BLM-managed lands.

BLM Instruction Memorandum 2012-169

This memorandum—Resource Management Plan Alternative Development for Livestock Grazing—provides guidance for developing livestock grazing alternatives during land use planning. Specifically, the memorandum provides a list describing examples of areas where the BLM could consider reducing, increasing, or eliminating livestock grazing within its range of alternatives for detailed analysis. Additionally, the memorandum describes instances where an alternative that considers no grazing may not be necessary or appropriate for an RMP.

National Landscape Conservation System Policies

Secretarial Order 3308, Management of the National Landscape Conservation System (November 15, 2010)

This order furthers the purposes of the Omnibus Public Land Management Act of 2009, which established the National Landscape Conservation System under the jurisdiction of the BLM. The purpose of the National Landscape Conservation System is to conserve, protect, and restore nationally significant landscapes that have outstanding cultural, ecological, and scientific values for the benefit of current and future generations. It directs the BLM to manage components of the National Landscape Conservation System to protect the values for which they were designated,

including prohibiting uses that are in conflict with the unit's values. Where consistent with such protection and with applicable laws, multiple uses may be allowed.

Manual 6100, National Landscape Conservation System Management (BLM 2012a)
The purpose of this manual is to provide general policy to BLM personnel on managing public lands in the National Landscape Conservation System according to the Omnibus Public Land Management Act of 2009.

Manual 6220, National Monuments, National Conservation Areas, and Similar Designations (BLM 2012b)
This manual provides guidance to BLM personnel on managing public lands that are components of the National Landscape Conservation System and that have been designated by Congress or the President as National Monuments, National Conservation Areas, and similar designations.

Manual 6320, Considering Lands with Wilderness Characteristics in the BLM Land Use Planning Process (BLM 2012c)
This manual contains the BLM's policy and guidance for considering lands with wilderness characteristics in its land use planning process under the FLPMA{ XE "Federal Land Policy and Management Act (FLPMA)" } and other applicable law. It supersedes all previous guidance on this topic. It does not address or affect policy related to congressionally designated Wilderness or existing Wilderness Study Areas (WSAs) pending before Congress.

Manual 6330, Management of Wilderness Study Areas (BLM 2012d)
This manual provides BLM personnel with general policies for managing WSAs. It outlines procedures to ensure the congressional mandate to manage WSAs "so as not to impair the suitability of such areas for preservation as wilderness" will be met.

Manual 6340, Management of Designated Wilderness Areas (BLM 2012e)
This manual provides BLM personnel with general policies for managing BLM Wilderness Areas designated by Congress. This manual outlines procedures to ensure the congressional mandate to manage each Wilderness Area "to preserve its wilderness character" will be met.

Manual 6400, Wild and Scenic Rivers—Policy and Program Direction for Identification, Evaluation, Planning, and Management (BLM 2012f)
This manual provides BLM personnel with policies and program guidance for conducting Wild and Scenic River studies in the land use planning process, environmental analysis, and legislative reporting. It sets forth requirements for designated rivers and for river segments determined to be eligible or suitable for inclusion in the National Wild and Scenic Rivers System. It also expands on the DOI - US Department of Agriculture Final Revised Guidelines for Eligibility, Classification, and Management of River Areas (47 FR 39454).

Other

- Handbook H-1601-1, Land Use Planning Handbook (BLM 2005). The BLM Land Use Planning Handbook provides supplemental guidance for implementing the BLM land use planning requirements established by Sections 201 and 202 of the FLPMA{ XE "Federal Land Policy and Management Act (FLPMA)" } (42 USC 1711-1712) and the

regulations at 43 CFR, Part 1600. It provides guidance for preparing or amending BLM land use plans.

- Manual 4180, Land Health (BLM 2009). This manual establishes policy, provides guidelines, and assigns management structure and responsibilities for conducting land health evaluations.
- Handbook H-4180-1, Rangeland Health{ XE "Rangeland Health" } Standards (BLM 2001). This handbook gives specific direction for implementing the policies listed in the BLM Manual 4180. It describes the authorities, objectives, and policies that guide the implementation of the Healthy Rangeland Initiative.
- Handbook H-4400-1, Rangeland Monitoring and Evaluation (BLM 1989). This handbook provides guidance related to monitoring and evaluation plans, monitoring schedules, coordination, training, and sampling.
- IM 2009-007, Process for Evaluating Status of Land Health and Making Determinations of Causal Factors When Land Health Standards Are Not Achieved. This policy establishes requirements for the work that must be completed before the BLM Authorized Officer signs a determination document that identifies significant causes for not achieving land health standards. It provides an updated procedure for evaluating land health, making determinations, and developing appropriate actions that will make significant progress toward achieving land health standards developed in accordance with 43 CFR 4180.2(c).
- IM 2013-094, Resource Management During Drought. Provides general guidance regarding BLM program management in the face of drought. It also provides specific livestock grazing program guidance.
- Assessment, Inventory, and Monitoring{ XE "Assessment, Inventory, and Monitoring (AIM)" } (AIM) Strategy (Toevs et al. 2011; Information Bulletin No. 2012-080). The AIM Strategy establishes a framework for collecting monitoring data that is consistent and compatible across scales, programs, and administrative boundaries. Implementation of the AIM Strategy will provide defensible, quantitative data to inform decisions and allow data to be collected once and used many times for many purposes.
- Programmatic agreement for livestock grazing. A Programmatic agreement related to livestock grazing management, currently under development between GSENM and Glen Canyon, would allow the agencies to share a breadth of data, including locational information related to cultural resources—and to areas known to have concentrations of livestock. Using these data, especially in conjunction with permittee input, should provide a tool that could help pre-plan the location of range improvements to avoid or minimize potential adverse effects to historic properties. This approach should also help direct future monitoring and survey activities and broader collaboration between GSENM and Glen Canyon.
- Manual 8100, The Foundations for Managing Cultural Resources (BLM 2004). This manual is intended as a reference source to provide BLM managers with basic information and general summary guidance for managing cultural resources.

- Manual 1780, Tribal Relations (BLM 2016a). This manual defines the policies, roles and responsibilities, and standards for BLM tribal relations and government-to-government tribal consultation within a comprehensive framework of those legal authorities affecting this relationship.
- Handbook H-1780-1, Improving and Sustaining BLM-Tribal Relations (BLM 2016b). This handbook addresses a broad range of legal authorities and agency programs of interest to tribes and also highlights BLM responsibilities.

1.6.2 NPS

NPS Organic Act, as Amended

By enacting the Organic Act of 1916, Congress directed the US Department of the Interior and NPS to manage units of the National Park System "to conserve the scenery and the natural and historic objects and the wild life therein and to provide for the enjoyment of the same in such manner and by such means as will leave them unimpaired for the enjoyment of future generations" (54 USC, Section 100101). Section 3 of the NPS Organic Act permits the Secretary of the Interior to grant the privilege to graze livestock in all parks except Yellowstone National Park when such grazing is not "detrimental to the primary purpose" of the affected parks.

The 1978 Redwood Amendment (see below) reiterates this mandate by stating that NPS must conduct its actions to ensure no "derogation of the values and purposes for which these various areas have been established, except as may have been or shall be directly and specifically provided by Congress" (54 USC, Section 100101a-21a). Congress intended the language of the Redwood Amendment to reiterate the provisions of the Organic Act, not to create a substantively different management standard.

The House Committee report described the Redwood Amendment as a "declaration by Congress" that the promotion and regulation of the national park system is to be consistent with the Organic Act. The Senate Committee report stated that under the Redwood Amendment, "The Secretary has an absolute duty, which is not to be compromised, to fulfill the mandate of the 1916 Act to take whatever actions and seek whatever relief as will safeguard the units of the national park system." Although the Organic Act and the Redwood Amendment use different wording ("unimpaired" and "derogation") to describe what NPS must avoid, both acts define a single standard for managing the National Park System, not two different standards. For simplicity, NPS Management Policies 2006 (NPS 2006) uses "impairment," not both statutory phrases, to refer to that single standard.

Despite these mandates, the Organic Act and its amendments afford NPS latitude when making resource decisions to allow appropriate visitor use while preserving resources. By these acts, Congress "empowered [NPS] with the authority to determine what uses of park resources are proper and what proportion of the park's resources are available for each use" (Bicycle Trails Council of Marin v. Babbitt, 82 F.3d 1445, 1453 [9th Cir. 1996]). In accordance with the NPS Guidance for Non-Impairment Determinations and NPS NEPA{ XE "National Environmental Policy Act (NEPA)" } Process (NPS 2011a), a nonimpairment determination for the selected alternative will be appended to the ROD.

National Parks Omnibus Management Act of 1998

Both the National Parks Omnibus Management Act of 1998 (16 USC, Section 5901 et seq.) and NEPA{ XE "National Environmental Policy Act (NEPA)" } are fundamental to NPS park management decisions. Both acts provide direction for articulating and connecting the ultimate resource management decision to the analysis of impacts, using appropriate technical and scientific information. Both also recognize that such data may not be readily available and provide options for resource impact analysis in this case.

Redwood National Park Expansion Act of 1978, as Amended

Reasserting the system-wide standard of protection established by Congress in the original Organic Act, the Redwood Amendment stated:

> *The authorization of activities shall be construed and the protection, management, and administration of these areas shall be conducted in light of the high public value and integrity of the National Park System and shall not be exercised in derogation of the values and purposes for which these various areas have been established, except as may have been or shall be directly and specifically provided by Congress (Public Law 95-250, 54 USC, Section 100101a-2).*

Glen Canyon Enabling Legislation and Values and Purposes{ XE "Values and Purposes (Glen Canyon)" }

In 1972, Congress passed Glen Canyon's enabling legislation (Public Law 92-593). The purpose of the recreation area, as described in the enabling legislation, is "to provide public outdoor recreation use and enjoyment of Lake Powell and lands adjacent thereto…and to preserve and protect the scenic, scientific, and historic features contributing to public enjoyment of the area."

The values of Glen Canyon are the "scenic, scientific, and historic features" indicated in the recreation area's enabling legislation of 1972. The GzMP{ XE "Grazing Management Plan, Glen Canyon (GzMP 1999)" } specifically identified the following values and purposes: vegetation, soils, wildlife, water quality, cultural resources (historic and prehistoric), scenic resources, recreation, and paleontology.

Public Law 92-593 states, "…the Secretary shall administer, protect, and develop the recreation area in accordance with the provisions of the (Organic) Act of August 25, 1916 (54 USC, Section 100101 et seq.), as amended and supplemented, and with other statutory authority available to him for conservation and management of natural resources to the extent he finds such authority will further the purpose of this Act." The Redwood Amendment states that in areas of the National Park System, "The authorization of activities...shall not be exercised in derogation of the values and purposes for which these various areas have been established...."

Livestock Grazing Administration

Livestock grazing administration in Glen Canyon is described in **Section 1.3.1**. Additional direction is provided below.

NPS Management Policies (NPS 2006)

NPS Management Policies 2006 apply to livestock grazing in Glen Canyon. Section 8.6.8.2, Managing Agricultural Grazing, describes when the National Park Service permits grazing in a

park and which regulations must apply. It specifies, "The National Park Service must manage its resources in a manner that conserves them for future generations. Parks with agricultural livestock use, including parks where such use is administered by another agency, must address this use in an appropriate planning document. Agricultural livestock grazing will use best management practices to protect park resources, with particular attention being given to protecting wetland{ XE "Wetland" } and riparian areas{ XE "Riparian Area" }, sensitive species and their habitats, water quality, and cultural resources. Managers must regulate livestock so that (1) ecosystem dynamics and the composition, condition, and distribution of native plants and animal communities are not significantly altered or otherwise threatened; and (2) cultural values are protected. A comprehensive monitoring program must be implemented, and adaptive management practices must be used to protect park resources."

Other key sections of the NPS Management Policies for this MMP{ XE "Monument Management Plan, Grand Staircase-Escalante National Monument (MMP 2000)" }-A/EIS are Section 1: Foundation; Section 2: Park Planning; Section 4: Natural Resources Management; Section 5: Cultural Resources Management; Section 6: Wilderness Management; Section 8: Use of the Parks; and Section 9: Park Facilities.

Director's Order 53, Special Park Uses

This sets forth the policies and procedures for administering special park uses on NPS-managed lands, which includes grazing. Section 10.5 provides guidance for domestic livestock management in parks that authorize livestock use when the use is "specifically authorized by a park's enabling act or other law". However, pursuant to the Glen Canyon Enabling Legislation (Public Law 92-593), Glen Canyon does not issue permits for grazing; the BLM administers grazing permits{ XE "Permit, Grazing" } on Glen Canyon-managed lands.

NPS Nonimpairment Policy

Section 1.4 of the 2006 NPS Management Policies guidance document discusses nonimpairment policies. The NPS must leave park resources and values{ XE "Resources and Values (Glen Canyon)" } unimpaired unless directly and specifically provided for by legislation or by the proclamation establishing the park. The relevant legislation or proclamation must provide explicitly (not by implication or inference) for the activity. Impairment is defined as "an impact that, in the professional judgment of the responsible NPS manager, would harm the integrity of park resources or values, including the opportunities that otherwise would be present for the enjoyment of those resources or values" (NPS 2006).

Before approving a proposed action that could lead to an impairment of park resources and values{ XE "Resources and Values (Glen Canyon)" }, the decision-maker must consider the impacts of the proposed action and determine, in writing, that the activity would not impair park resources and values. If there would be an impairment, the action must not be approved.

Other

Glen Canyon Foundation Document

The Glen Canyon Foundation Document provides basic guidance for planning and management decisions. The core components of the document include a description of the park, the park's purpose, significance, fundamental resources and values{ XE "Resources and Values (Glen

Canyon)" }, other important values, and interpretive themes. It also includes special mandates and administrative commitments, an assessment of planning and data needs that identifies planning issues{ XE "Planning Issues" }, planning products to be developed, and the associated studies and data required for park planning (NPS 2014).

The purpose statement for Glen Canyon is as follows:

> *Glen Canyon National Recreation Area, located at the center of the Colorado Plateau, provides for public enjoyment through diverse land- and water-based recreational opportunities, and protects scenic, scientific, natural, and cultural resources on Lake Powell, the Colorado River, its tributaries, and surrounding lands.*

Significance statements express why a park's resources and values{ XE "Resources and Values (Glen Canyon)" } are important enough to merit designation as a unit of the National Park System. These statements are linked to the purpose of Glen Canyon and are supported by data, research, and consensus. They describe the distinctive nature of each park and why an area is important within a global, national, regional, and system-wide context. They focus on the most important resources and values that will assist in park planning and management. The following significance statements have been identified for Glen Canyon:

- The Colorado River and its many tributaries, including the Dirty Devil, Paria, Escalante, and San Juan rivers, carve through the Colorado Plateau to form a landscape of dynamic and complex desert and water environments.
- The vast, rugged landscapes of Glen Canyon provide an unparalleled spectrum of diverse land- and water-based recreational opportunities for visitors of wide-ranging interests and abilities.
- Glen Canyon preserves a record of more than 10,000 years of human presence, adaptation, and exploration. This place remains significant for many descendant communities, providing opportunities for people to connect with cultural values and associations that are both ancient and contemporary.
- The deep, 15-mile-long, narrow gorge below the dam provides a glimpse of the high canyon walls, ancient rock art, and a vestige of the riparian and beach terrace environments that were seen by John Wesley Powell's Colorado River expedition in 1869, providing a stark contrast to the impounded canyons of Lake Powell.

Fundamental resources and values{ XE "Resources and Values (Glen Canyon)" } are those features, systems, processes, experiences, stories, scenes, sounds, smells, or other attributes determined to warrant primary consideration during planning and management processes. They are important because they are essential to achieving the purpose of the park and maintaining its significance. Fundamental resources and values are closely related to a park's legislative purpose and are more specific than significance statements.

Fundamental resources and values{ XE "Resources and Values (Glen Canyon)" } help focus planning and management efforts on what is truly significant about the park. One of the most important responsibilities of NPS managers is to ensure the conservation and public enjoyment

of those qualities that are essential (fundamental) to achieving the purpose of the park and maintaining its significance. If fundamental resources and values are allowed to deteriorate, the park purpose or significance could be jeopardized.

The following fundamental resources and values{ XE "Resources and Values (Glen Canyon)" } have been identified for Glen Canyon:

- **Heritage Resources**—Glen Canyon is the steward of heritage resources exemplified by the archeological and historic sites, cultural landscapes, and traditional cultural properties{ XE "Traditional Cultural Property (TCP)" } that illustrate the connection of people with the landscape of the Glen Canyon region.
- **Lake Powell**—Lake Powell, set dramatically against a backdrop of eroded red rock canyons and mesas, is the largest human-made lake in North America and is widely recognized by boating enthusiasts as one of the premier water-based recreation destinations in the world.
- **Landscape**—The vast landscape of Glen Canyon contains rugged water- and wind-carved canyons, buttes, mesas, rivers, seeps, springs{ XE "Spring" }, and hanging gardens where diverse habitats sustain an array of endemic, rare, and relict plant and animal communities.
- **Paleontology**—Glen Canyon preserves one of the most complete sections of Mesozoic strata in the world; new discoveries continuously add to our scientific understanding of the past.
- **Water**—Water quality and quantity is essential for public outdoor recreational use and enjoyment and for sustaining terrestrial and aquatic life in the high desert.

Director's Order 12, Environmental Impact Analysis

Director's Order 12 (NPS 2011b) and its accompanying handbook (NPS 2015) lay the groundwork for how NPS complies with NEPA{ XE "National Environmental Policy Act (NEPA)" }. Director's Order 12 and the handbook set forth a planning process for incorporating scientific and technical information and establishing a solid administrative record for NPS projects. Director's Order 12 requires that impacts on park resources be analyzed in terms of their context, duration, and intensity. It is crucial for the public and decision-makers to understand the implications of those impacts in the short term and long term, cumulatively and within context, based on an understanding and interpretation by resource professionals and specialists.

Director's Order 28, Cultural Resources Management

This Director's Order offers guidance in applying policies to establish, maintain, and refine park cultural resource programs. It refers users to the variety of technical manuals, handbooks, and other sources for specific program areas. Chapter 6, Section 5, states that, in accordance with NEPA{ XE "National Environmental Policy Act (NEPA)" }, at the earliest possible stage of planning, it must be determined (1) whether and at what level the proposed project area has been surveyed archaeologically, (2) whether archaeological resources eligible for listing on the National Register have been identified in the area, and (3) whether such resources will be affected by the proposed project.

Director's Order 41, Wilderness Stewardship

This Director's Order offers guidance for wilderness stewardship in eligible, proposed, recommended, and designated wilderness areas. Section 6 describes wilderness preservation, which includes scientific values, effects of climate change, and cultural resources, which are also identified in planning issues{ XE "Planning Issues" } for this MMP{ XE "Monument Management Plan, Grand Staircase-Escalante National Monument (MMP 2000)" }-A/EIS.

Glen Canyon General Management Plan{ XE "General Management Plan, Glen Canyon (GMP 1979)" } (NPS 1979)

This plan specifically identified the following values and purposes for the park unit: vegetation, soils, wildlife, water quality, cultural resources (historic and prehistoric), scenic resources, recreation, and paleontology. This plan also identified the primary management zones and objectives for Glen Canyon and established the park road system.

Resources Management Plan, Cultural Component, Glen Canyon National Recreation Area (NPS 1987)

The Cultural Resources Management Plan provides detailed information on how NPS personnel will carry out the programmatic responsibilities outlined in Director's Order 28. These responsibilities include research to identify, evaluate, and interpret the cultural resources at the recreation area. The Cultural Resources Management Plan also provides a means to integrate cultural resources management issues into recreation area planning.

1.7 Related Plans

The FLPMA{ XE "Federal Land Policy and Management Act (FLPMA)" } requires that the MMP{ XE "Monument Management Plan, Grand Staircase-Escalante National Monument (MMP 2000)" }-A, "…be consistent with State and local plans to the maximum extent… consistent with Federal law and the purposes of [the FLPMA]" (43 USC 1712[c][9]). The MMP-A also should be consistent with the purposes, policies, and programs of federal laws and regulations applicable to BLM-administered lands. Plans formulated by federal, state, local, and tribal governments that relate to land and resource management have been reviewed and considered as the MMP-A/EIS has been developed. An evaluation of consistency with these related plans has begun, and results are presented in **Section 5.4**.

1.7.1 Other Federal Plans

- Kanab Field Office Resource Management Plan (BLM 2008b)—This RMP provides management direction for the KFO. The BLM GSENM retains livestock grazing administration responsibility for certain allotments that are in both the Kanab Field Office and GSENM. The KFO is responsible for all other aspects of land management, as directed by the KFO RMP.
- Arizona Strip Field Office Record of Decision and Resource Management Plan (BLM 2008c)—This RMP provides management direction for the ASFO. The BLM GSENM retains livestock grazing administration responsibility for certain allotments that are in both the ASFO and GSENM. The ASFO is responsible for all other aspects of land management, as directed by the ASFO RMP.
- Paria Canyon-Vermilion Cliffs Wilderness Management Plan (BLM 1984)—This management plan provides management direction for the Paria Canyon-Vermilion Cliffs Wilderness, which includes decisions for livestock grazing management.

- Dixie National Forest Land and Resource Management Plan (Forest Service 1986), as amended—Certain allotments in the decision area extend onto the Dixie National Forest. While the Forest Service is responsible for all management decisions pertaining to the portion of the allotments on the National Forest, the BLM is responsible for permit administration on the portions in the planning area. The BLM coordinates with the Dixie National Forest to maintain a cohesive grazing system on the common allotments.

1.7.2 State Statutes and Plans

- Utah Code, Title 63J Chapter 4, Part 4, Planning—This part describes the duties of the planning coordinator and office.
- Utah Code, Title 63J, Chapter 8, State of Utah Resource Management Plan for Federal Lands—Within this chapter, Section 105.8 established the Utah Grazing Agricultural Commodity Zones. The Escalante Region Grazing Zone is one of many grazing zones across Utah. The purpose of these grazing zones are as follows:
  - Preserving and protecting the agricultural livestock industry from ongoing threats
  - Preserving and protecting the history, culture, customs, and economic value of the agricultural livestock industry from ongoing threats
  - Maximizing efficient and responsible restoration, reclamation, preservation, enhancement, and development of forage and watering resources for grazing and wildlife practices and affected natural, historical, and cultural activities

1.7.3 Local Government Plans

- Coconino County Comprehensive Plan—This plan was adopted in 2003 but is being revised. The plan addresses growth, conservation, and development and includes a section on preserving ranches and ranchlands in the county.
- Garfield County General Management Plan{ XE "General Management Plan, Glen Canyon (GMP 1979)" } (adopted November 8, 2007)—This plan establishes criteria, policies, and requirements to be met in the federal land use planning process. It documents baseline conditions for analysis and states that, where quantified data is not available, professional judgment must defer to policies and objectives outlined in the Garfield County Resource Management Plan. A 2013 amendment addresses the cultural and historic value of grazing and places the Escalante Historic/Cultural Grazing Region on the County Register of Cultural and Historic Resources.
- Kane County General Plan (adopted June 22, 1998; last amended November 9, 2016)—This plan addresses growth and development and partnerships with federal agencies in Kane County. It was amended in August 2014 to adopt the Escalante Region Multiple Use/Multiple Functions Grazing Zone in response to public concerns on grazing of public lands versus private lands and agricultural pursuits. The grazing zone emphasizes the social, economic, historic, and cultural importance of grazing to Kane County and its residents.

- Kane County Land Use Ordinance, Chapter 27, Escalante Region Multiple Use/Multiple Functions Grazing Zone (last amended September 22, 2014)—Chapter 27 of the Kane County Land Use Ordinance establishes the Escalante Region Multiple Use/Multiple Functions Grazing Zone, which overlaps GSENM. The ordinance states that the purpose of providing a multiple use/multiple functions zone are to establish areas that are open and generally undeveloped lands where human habitation would be limited. The zone is designed to enhance and protect land and associated open space resources. It is established to encourage the use of land, where appropriate, for livestock grazing, wildlife habitat, and recreation, among other uses. This zone is established to protect all valid private property rights and the continued use and full access to these rights. This zone is intended to promote the health, safety, convenience, order, prosperity, and general welfare and economy of the inhabitants of Kane County, tourists, and future generations.
- Kane County Resource Management Plan (adopted June 22, 1998; last amended November 9, 2016)—This document establishes the county's resource development goals, objectives, and policies, in coordination with the county Land Use Authority. It addresses the county's current and future desired conditions for land use and development, grazing, and natural resource management.

1.8 REFERENCES

BLM (US Department of the Interior, Bureau of Land Management). 1981a. Escalante Management Framework Plan. BLM, Escalante Resource Area, Cedar City District. April 22, 1981.

______. 1981b. Paria Management Framework Plan. BLM, Kanab Resource Area, Cedar City District. April 22, 1981.

______. 1981c. Vermilion Management Framework Plan. BLM, Kanab Resource Area, Cedar City District. April 22, 1981.

______. 1981d. Zion Management Framework Plan. BLM, Kanab Resource Area, Cedar City District. April 22, 1981.

______. 1984. Paria Canyon-Vermilion Cliffs Wilderness Management Plan. Coconino County, Arizona, and Kane County, Utah.

______. 1989. Handbook H-4400-1, Rangeland Monitoring and Evaluation. Rel. 4-98. November 11, 1989.

______. 1997. Utah BLM Standards for Rangeland Health{ XE "Rangeland Health" } and Guidelines for Livestock Grazing Management. Internet website: http://www.blm.gov/ut/st/en/fo/vernal/grazing_/rangeland_health_standards.html.

______. 1999. Escalante Management Framework Plan Approved Amendment and Record of Decision. BLM Utah State Office, Salt Lake City. March 15, 1999.

______. 2000. Grand Staircase-Escalante National Monument Management Plan{ XE "Monument Management Plan, Grand Staircase-Escalante National Monument (MMP 2000)" } and Record of Decision. BLM, Grand Staircase-Escalante National Monument, Cedar City, Utah. February 2000.

______. 2001. Handbook H-4180-1, Rangeland Health{ XE "Rangeland Health" } Standards. BLM, Washington, DC. January 19, 2001.

______. 2004. Manual 8100, The Foundations for Managing Cultural Resources. BLM, Washington, DC. December 3, 2004.

______. 2005. Handbook H-1601-1, Land Use Planning Handbook. BLM, Washington, DC. March 11, 2005.

______. 2008a. Handbook H-1790-1: NEPA{ XE "National Environmental Policy Act (NEPA)" } Handbook. Rel. 1-1710, January 30, 2008. BLM, Washington, DC.

______. 2008b. Kanab Field Office Record of Decision and Approved Resource Management Plan. BLM, Kanab Field Office, Kanab, Utah. October 2008.

______. 2008c. Arizona Strip Field Office Record of Decision and Resource Management Plan. BLM, Arizona Strip Field Office, St. George, Utah. February 2008.

______. 2009. Manual 4180, Land Health. BLM, Washington, DC. Rel. 4-110. January 16, 2009.

______. 2012a. Manual 6100, National Landscape Conservation System Management. Rel. 6-131. BLM, Washington, DC. July 13, 2012. Internet website: http://www.blm.gov/style/medialib/blm/wo/Information_Resources_Management/policy/blm_manual.Par.64370.File.dat/6100.pdf.

______. 2012b. Manual 6220, National Monuments, National Conservation Areas, and Similar Designations. BLM, Washington, DC.

______. 2012c. Manual 6320, Considering Lands with Wilderness Characteristics in the BLM Land Use Planning Process. BLM, Washington, DC.

______. 2012d. Manual 6330, Management of Wilderness Study Areas. BLM, Washington, DC.

______. 2012e. Manual 6340, Management of Designated Wilderness Areas. BLM, Washington, DC.

______. 2012f. Manual 6400, Wild and Scenic Rivers – Policy and Program Direction for Identification, Evaluation, Planning, and Management. BLM. Washington, DC.

______. 2016a. Manual 1780, Tribal Relations. BLM, Washington, DC. December 15, 2016.

______. 2016b. Handbook H-1781-1, Improving and Sustaining BLM-Tribal Relations. BLM, Washington, DC. December 15, 2016.

BLM GIS. 2014. Base GIS data on file with BLM's eGIS Server used for calculations or figures to support the MMP{ XE "Monument Management Plan, Grand Staircase-Escalante National Monument (MMP 2000)" }-A. BLM, Grand Staircase Escalante National Monument, Utah.

Forest Service (US Department of Agriculture, National Forest Service). 1986. Dixie National Forest Land and Resource Management Plan. Dixie National Forest, Cedar City, Utah.

NPS (US Department of the Interior, National Park Service). 1979. Proposed General Management Plan{ XE "General Management Plan, Glen Canyon (GMP 1979)" }. July 1979, reprinted August 1991. Glen Canyon Recreation Area, Page, Arizona.

______. 1987. Final Resource Management Plan, Cultural Component, Glen Canyon National Recreation Area. April 1987. Glen Canyon National Recreation Area. National Park Service – Rocky Mountain Region.

______. 1999. Glen Canyon National Recreation Area Grazing Management Plan{ XE "Grazing Management Plan, Glen Canyon (GzMP 1999)" } and Finding of No Significant Impact. NPS, Glen Canyon National Recreation Area, Page, Arizona. August 1999.

______. 2006. Management Policies. US Department of the Interior, National Park Service. ISBN 0-16-076874-8.

______. 2011a. Guidance for Non-Impairment Determination and the NPS NEPA{ XE "National Environmental Policy Act (NEPA)" } Process. NPS, Washington DC. October 31, 2011.

______. 2011b. Director's Order #12: Conservation Planning, Environmental Impact Analysis, and Decision-Making. NPS, Washington DC. Effective October 5, 2011.

______. 2014. Foundation Document for Glen Canyon National Recreation Area and Rainbow Bridge National Monument. National Park Service, Arizona and Utah. September 2014. Internet website: http://www.nps.gov/glca/learn/upload/GLCA-RABR_OV_SP.pdf.

______. 2015. National Park Service NEPA{ XE "National Environmental Policy Act (NEPA)" } Handbook. NPS, Washington DC. September 2015. Internet website: http://www.nps.gov/orgs/1812/upload/NPS_NEPAHandbook_Final.pdf.

Presidential Proclamation No. 6290. Establishment of Grand Staircase-Escalante National Monument. September 18, 1996.

Toevs, G. R., J. J. Taylor, C. S. Spurrier, W. C. MacKinnon, and M. R. Bobo. 2011. Bureau of Land Management Assessment, Inventory, and Monitoring{ XE "Assessment, Inventory, and Monitoring (AIM)" } Strategy: For integrated renewable resources management. BLM, National Operations Center, Denver, Colorado.

This page intentionally left blank.

Chapter 3
Affected Environment

TABLE OF CONTENTS

Chapter Page

TABLES

Page

FIGURES Page

This page intentionally left blank.

3. Affected Environment

DO NOT DELETE THIS PAGE from the MS Word file, as this is what marks Heading 1 for the table of contents. (Do delete this page later from the Adobe Acrobat [pdf] file.)

THROW THIS PAGE AWAY & DELETE FROM PDF

CHAPTER 3
AFFECTED ENVIRONMENT

The purpose of this chapter is to describe the existing biological, physical, and socioeconomic characteristics of the planning area, including human uses that could be affected by implementing the alternatives described in **Chapter 2**. Discussions of topic areas are divided into resources, resource uses, special designations, social and economic conditions, and tribal interests. Each section includes the following:

- A description of current conditions
- A characterization of trends (which express the direction of change between the present and some point in the past)

Where applicable, there is also a discussion of potentially impacted GSENM objects (as outlined in its establishing proclamation in 1996) and Glen Canyon values and purposes (as outlined in its enabling legislation in 1972). This discussion is included only in sections related to GSENM objects and Glen Canyon values and purposes.

Information from broad-scale assessments was used to help set the context for the planning area. The information and direction for resources and resource uses has been further broken down into fine-scale assessments and information. The level of information presented in this chapter is sufficient to assess potential effects discussed in **Chapter 4**, based on the alternatives presented in **Chapter 2**.

Acreage figures and other numbers are approximated using geographic information systems (GIS) technology and do not reflect exact measurements or precise calculations.

The planning area includes all BLM-managed lands within GSENM and BLM- and NPS-managed lands for which GSENM has livestock grazing administration responsibility. This includes lands in portions of the BLM's KFO and ASFO, as well as NPS-managed lands in Glen Canyon. The BLM's decision area for this planning effort includes all BLM-managed lands for which GSENM has livestock grazing administration responsibility, including some lands in the BLM KFO and

ASFO. The NPS decision area includes lands in Glen Canyon for which GSENM has livestock grazing administration responsibility.

A portion of the designated corridor of the Old Spanish National Historic Trail is within the planning area and primarily follows Highway 89. The route in the vicinity of the designated corridor was used for one round-trip before it was abandoned for a northerly route. Because it was only used one time, no trail remnants or assicated sites are present. The primary concern for the designated corridor is visual impacts. There would be no visual impacts from livestock grazing that would affect the experience of travelers along the designated corridor seeking to experience the Old Spanish National Historic Trail. Therefore, this topic is not discussed further in this document.

3.1 Livestock Grazing

The primary laws that govern livestock grazing on public lands are the Taylor Grazing Act{ XE "Taylor Grazing Act" } of 1934, FLPMA{ XE "Federal Land Policy and Management Act (FLPMA)" }, and the Public Rangelands Improvement Act{ XE "Public Rangelands Improvements Act" } of 1978. In addition, the BLM manages grazing lands under 43 CFR, Part 4100 and applicable policy. Grazing in GSENM is also governed by Proclamation 6920, Establishment of the Grand Staircase-Escalante National Monument, which was issued September 18, 1996, by President William J. Clinton. The text of the proclamation relevant to livestock grazing states "Nothing in this proclamation shall be deemed to affect existing permits or lease for, or levels of, livestock grazing on Federal lands within the monument; existing grazing uses shall continue to be governed by applicable laws and regulations other than this proclamation."

In Glen Canyon, the BLM administers livestock grazing permits{ XE "Permit, Grazing" } in accordance with the 54 USC, Section 100101(a) et seq. and Glen Canyon's enabling legislation (Public Law 92-593). As clarified by the Redwoods Act of March 27, 1978 in areas of the National Park System, "The authorization of activities . . . shall not be exercised in derogation of the values and purposes for which these various areas have been established except as may have been or shall be directly and specifically provided by Congress." In other words, livestock grazing and associated management cannot impair the values and purposes of Glen Canyon, as identified in the enabling legislation.

NPS policy statements pertaining to commercial livestock grazing are found in NPS Management Policies, Chapter 4, Section 4.4.4.1, and Chapter 8, Section 8.6.8 (NPS 2006).

The 1979 Glen Canyon GMP{ XE "General Management Plan, Glen Canyon (GMP 1979)" } (NPS 1979) specifically identified the following values and purposes: vegetation, soils, wildlife, water quality, cultural resources (historic and prehistoric), scenic resources, recreation, and paleontology. Grazing, although not a purpose of the recreation area, is a use recognized by Congress in Glen Canyon's enabling legislation.

On September 4, 1984, to foster coordination between the two agencies, the directors of the BLM and the NPS signed an umbrella memorandum of understanding for grazing administration in units of the NPS where grazing is authorized. To implement this memorandum of understanding, Glen Canyon and both the BLM Utah and Arizona state offices executed an interagency agreement in 1993. The intent of this agreement is to "conduct a program to

coordinate grazing administration activities on [Glen Canyon] which shall be carried out by the respective BLM District Managers of the Arizona Strip, Cedar City, Richfield, and Moab Districts . . . and in coordination and cooperation with the Superintendent of [Glen Canyon]."

To give further clarity to the Glen Canyon values and purposes with respect to grazing practices across the recreation area, the NPS developed the Glen Canyon GzMP{ XE "Grazing Management Plan, Glen Canyon (GzMP 1999)" } in 1999 (NPS 1999). This foundational document gives management direction for the future of grazing practices across the recreation area. It was made to be flexible, allowing new data and methods to be incorporated into the determinations of park values and resource conditions and the management of livestock practices.

History

Domestic livestock was introduced into southern Utah and northern Arizona as a result of exploration and trade along the Spanish Trail, beginning in the late 1700s. With subsequent Euro-American settlement in the late 1800s, grazing on lands currently administered by GSENM became well established; the number of cattle, sheep, and horses increased rapidly until the early 1900s. Grazing use in the region has substantially decreased from its peak in the early part of the 20th century. Livestock grazing became a regulated and permitted activity on National Forest System lands in the decade before World War I.

In contrast, BLM-managed lands were treated as a commons in which those who moved their stock onto the range first each season secured the use of new forage growth. Stock from across the region were brought to graze during the winter, and many animals were left on the range year-round. This period of unregulated use and overgrazing resulted in impacts on rangeland resources and ecological conditions, especially at lower elevations used for winter grazing.

The passage of the Taylor Grazing Act{ XE "Taylor Grazing Act" } in 1934 secured federal control of the winter ranges. During the following years, the federal government established regulations pertaining to operators, allotments, kind and number of livestock, and season-of-use on public land. During the late 1950s and early 1960s, the BLM completed range surveys to determine the capacity of the land for grazing.[1] Following these surveys, the BLM adjudicated decisions on forage and reduced livestock numbers on most allotments.

A federal court order on April 11, 1975, required the BLM to prepare grazing EISs during a 10-year period. To comply with this order, the BLM conducted range suitability analyses and field surveys on grazing capacity between 1975 and 1979. In 1980, the BLM issued the Kanab/Escalante Grazing Final EIS (BLM 1980a) and began making adjustments in number and season-of-use of livestock.[2] The EIS allocated 68,298 AUMs to livestock initially and 91,444 AUMs upon full implementation of the plan, which was identified as being 24 years later, or 2005. The increase in forage production was to be achieved by increasing production of

[1] Typical methods for conducting range surveys included the ocular reconnaissance method, the square foot density method, and the weight estimate method. These typically involved estimates of forage values, amounts available for use, and levels of use of vegetation.

[2] The BLM Cedar City District Office conducted an ocular reconnaissance forage inventory from 1975 to 1979, which provided the basis for the available AUMs in the EIS.

desirable vegetation, improving watershed conditions and wildlife habitat, and with vegetation treatments{ XE "Vegetation Treatment" } and rangeland developments such as fences and water developments (BLM 1980a). (Note that the planning area for the 1980 EIS included lands outside of the decision area for this MMP{ XE "Monument Management Plan, Grand Staircase-Escalante National Monument (MMP 2000)" }-A/EIS.)

The State of Utah School and Institutional Trust Lands Administration formerly managed approximately 175,000 acres in GSENM and approximately 40,000 acres in Glen Canyon. The State of Utah and the federal government exchanged these lands in 1998 for lands outside of GSENM and Glen Canyon.

Most of the former state lands transferred to the BLM are grazed in conjunction with the adjoining BLM allotments through exchange of use agreements. Some of the transferred lands are fenced square miles that are administered as individual allotments. In accordance with the congressional legislation authorizing the exchange, the BLM administered former state grazing permits{ XE "Permit, Grazing" } under their original (state-issued) terms and conditions until they expired (Utah Schools and Land Exchange Act of 1998; Public Law 105-335). As of 2011, all of the original state-issued permits have expired; the BLM now administers the permits.

The BLM authorizes livestock grazing in the decision area via permits. There are no leases for livestock grazing in the decision area. P~~These p~~ermits authorize grazing and contain terms and conditions under which permittees make grazing use during the term of the~~ lease or~~ permit. use is the number of AUMs made available via an applicable land use plan. Within the permitted use, the grazing permit{ XE "Permit, Grazing" } identifies active use (the AUMs authorized for use) and suspended{ XE "Suspension" } use (the AUMs not authorized for use). When GSENM was designated in 1996, there were approximately 77,400 active AUMs. Actual use that year was approximately 51,900 AUMs, or 67 percent of active permitted. Today, there are 76,957 active AUMs of a maximum permitted 106,202, with actual use averaging just over 41,000 AUMs, or 53 percent of active permitted.[3]

Range Improvements{ XE "Range Improvement" }

Range improvements{ XE "Range Improvement" } are physical modification or treatment of rangelands, including use of mechanical devices or means, designed to achieve the following:

- Improve forage production
- Change vegetation composition
- Control patterns of use
- Provide water
- Stabilize soil and water conditions

[3] Reasons for permittees to take or apply for temporary nonuse may include forage amount or condition, water availability, market fluctuation, personal preferences of the permittee, flexibility in herd management, and fire recovery.

- Restore, protect, and improve the condition of rangeland ecosystems to benefit livestock, wild horses and burros, and fish and wildlife

There are two categories of range improvements{ XE "Range Improvement" }: nonstructural and structural. Nonstructural range improvements are seedings{ XE "Seeding" } and other vegetation treatments{ XE "Vegetation Treatment" }; structural range improvements are fences, corrals, stock trails, line cabins, cattle guards, and water developments. In Glen Canyon, decisions related to livestock grazing administration are made in consultation with the NPS.

Existing rangeland seedings{ XE "Seeding" } were originally completed throughout the planning area to provide forage for livestock, to reduce erosion, and to enhance watershed functionality. A rangeland seeding is a type of nonstructural range improvement{ XE "Range Improvement" } where a vegetation type or community has been established through the artificial dissemination of seed and by clearing away vegetation, typically. The original seedings were typically monocultures of crested wheatgrass or Russian wild rye. Seedings that are more recent have consisted of a mixture of native and nonnative species that include shrubs, forbs, and grasses.

In some cases, seedings{ XE "Seeding" } were established to help improve the management of nearby resources. For example, in order to entice cattle away from riparian areas{ XE "Riparian Area" }, some areas have been treated to provide palatable forage outside of the riparian zone. Currently in GSENM, vegetation treatments{ XE "Vegetation Treatment" } in seedings are primarily intended to restore vegetation communities and wildlife habitat or to manage livestock use. No seedings are allowed on NPS-managed lands, except on a case-by-case basis for ecological restoration. The BLM has completed nonstructural range improvements{ XE "Range Improvement" } on approximately four percent of the decision area. The BLM maintains these seedings, although some are no longer functioning at a desired ecological level in the Upper Paria, Last Chance, Circle Cliffs, Vermilion, Mollies Nipple, Coyote, Cottonwood, and Headwaters allotments. The BLM has treated some of the no longer functioning seedings in order to restore them, with varying levels of success. The BLM bases current forage allocations on the presence and maintenance of these seedings. The failure of some of these seedings is partially responsible for actual use levels below permitted use.

The BLM authorizes most range improvements{ XE "Range Improvement" } through a cooperative range improvement agreement (43 CFR, Subpart 4120.3-2). Improvements authorized through such an agreement are permanent range improvements or rangeland developments (structural or nonstructural) needed to achieve management or resource condition objectives. Range improvements authorized under a cooperative range improvement agreement up to August 21, 1995, may be co-owned by the United States and the permittee; those issued after August 21, 1995, are owned by the United States alone. The costs of

installing, maintaining, or modifying the improvements may be shared by the Government and the permittee, as specified in the cooperative range improvement agreement.[4]

The BLM also authorizes range improvements{ XE "Range Improvement" } through a range improvement permit (43 CFR, Subpart 4120.3-3). Improvements authorized through such a permit are needed to achieve management objectives for the allotment in which the permit ~~or~~ held. Such improvements are removable or temporary, such as livestock handling facilities (e.g., corrals, handling equipment, and loading chutes) and troughs. The permittee owns range improvements issued under a range improvement permit and is generally responsible for maintaining such improvements.

In Glen Canyon, nonstructural range improvements{ XE "Range Improvement" }, land treatments, and new line cabins are not permitted, according to the 1993 Interagency Agreement between the BLM and NPS for grazing management. Other range improvements could be permitted, subject to 54 USC, Section 100101(a) et seq., the Glen Canyon enabling legislation, the Glen Canyon GzMP{ XE "Grazing Management Plan, Glen Canyon (GzMP 1999)" }, and the Glen Canyon GMP{ XE "General Management Plan, Glen Canyon (GMP 1979)" }. The Glen Canyon Superintendent first must complete a determination regarding the potential effects of the proposed action on the values and purposes of Glen Canyon.

Rangeland Health{ XE "Rangeland Health" } Standards

The regulations at 43 CFR, Part 4180 (developed by the Secretary of the Interior on February 22, 1995) indicate that the BLM must ensure that the following four fundamentals of rangeland health{ XE "Range Land Health, Fundamental of" }{ XE "Rangeland Health" } exist on BLM-managed lands:

- Watersheds are in, or making significant progress toward, properly functioning physical condition, including their upland, riparian wetland{ XE "Wetland" }, and aquatic components; soil and plant conditions support infiltration, soil moisture storage, and the release of water that are in balance with climate and landform and maintain or improve water quality, and timing and duration of flow.
- Ecological processes, including the hydrologic cycle nutrient cycle, and energy flow, are maintained, or there is significant progress toward their attainment, in order to support healthy biotic populations and communities.
- Water quality complies with state water quality standards and achieves, or is making significant progress toward achieving established BLM management objectives such as meeting wildlife needs.

[4] On July 12, 2006, the BLM promulgated new grazing regulations, but these regulations became the subject of a federal lawsuit and were ultimately enjoined in all respects by the Federal District Court of Idaho. As a result of the court's decision, the BLM applies the grazing regulations as they existed prior to the 2006 rulemaking. This has been reiterated in several IMs from the BLM Washington Office. See BLM-WO IM 2007-004, "Grazing Regulations Status" (October 10, 2006), IM 2007-137 "Idaho District Court Enjoins Grazing Regulations" (June 15, 2007), and IM 2009-109 "Idaho District Court Order and Judgment Enjoins Grazing Regulations" (September 30, 2010).

- Habitats are, or are making significant progress toward being, restored or maintained for Federal threatened and endangered species, Federal proposed, Category 1 and 2 Federal candidate, and other special status species.

The BLM Utah adopted *Standards for Rangeland Health*{ *XE* "Rangeland Health" } *and Guidelines for Grazing Management for BLM Lands in Utah* (BLM 1997) that are to be applied to all BLM-managed rangelands in Utah and to the portion of the ASFO for which GSENM administers grazing. The BLM uses information gathered through rangeland monitoring (i.e., trend), Interpreting the Indicators of Rangeland Health (Pellant et al. 2005), proper functioning condition (PFC) assessments, water quality sampling, and other resource assessments by staff specialists. It uses these to evaluate whether allotments are meeting the BLM Utah Standards for Rangeland Health.

The four rangeland health{ XE "Rangeland Health" } standards are described below.

Standard 1: Upland soils exhibit permeability and infiltration rates that sustain or improve site productivity, considering the soil type, climate, and landform. As indicated by:

- Sufficient cover and litter to protect the soil surface from excessive water and wind erosion, promote infiltration, detain surface flow, and retard soil moisture loss by evaporation.
- The absence of indicators of excessive erosion such as rills, soil pedestals, and actively eroding gullies.
- The appropriate amount, type, and distribution of vegetation reflecting the presence of 1) the desired plant community, where identified in a land use plan conforming to these standards, or 2) where the desired plant community is not identified, a community that equally sustains the desired level of productivity and properly functioning ecological conditions.

Standard 2: Riparian and wetland{ XE "Wetland" } areas are in properly functioning condition. Stream channel morphology and functions are appropriate to soil type, climate, and landform. As indicated by:

- Streambank vegetation consisting of, or showing a trend toward, species with root masses capable of withstanding high stream flow events. Vegetative cover adequate to protect streambanks and dissipate stream flow energy associated with high water flows, protect against accelerated erosion, capture sediment, and provide for groundwater recharge.
- Vegetation reflecting: desired plant community, maintenance of riparian and wetland{ XE "Wetland" } soil moisture characteristics, diverse age structure and composition, high vigor, large woody debris when site potential allows, and providing food, cover, and other habitat needs for dependent animal species.
- Revegetating point bars; lateral stream movement associated with natural sinuosity; channel width, depth, pool frequency and roughness appropriate to landscape position.

- Active floodplain.

<u>Standard 3:</u> Desired species, including native, threatened, endangered, and special status species, are maintained at a level appropriate for the site and species involved. As indicated by:

- Frequency, diversity, density, age class, and productivity of desired native species necessary to ensure reproductive capability and survival.
- Habitats connected at a level to enhance species survival.
- Native species reoccupy habitat niches and voids caused by disturbances unless management objectives call for introduction or maintenance of nonnative species.
- Habitats for threatened, endangered, and special status species managed to provide for recovery and move species toward de-listing.
- Appropriate amount, type, and distribution of vegetation reflecting the presence of 1) the desired plant community, where identified in a land use plan conforming to these Standards, or 2) where the desired plant community is not identified, a community that sustains the desired level of productivity and properly functioning ecological processes.

<u>Standard 4:</u> The BLM will apply and comply with water quality standards established by the State of Utah (R.317-2) and the Federal Clean Water and Safe Drinking Water Acts. Activities on BLM-managed lands will fully support the designated beneficial uses described in the Utah Water Quality Standards (R.317-2) for surface and groundwater. As indicated by:

- Measurement of nutrient loads, total dissolved solids, chemical constituents, fecal coliform, water temperature and other water quality parameters.
- Macro-invertebrate communities that indicate water quality meets aquatic objectives.

The NPS uses rangeland health{ XE "Rangeland Health" } standards as well, but they are supplemental to other methods and assessments.

Assessing Resource Conditions and Evaluating Rangeland Health{ XE "Rangeland Health" }

Range management is an adaptive process where ongoing grazing is appraised through monitoring, then modified, and then re-appraised. Monitoring to assess whether the level of use is sustainable and whether other resource objectives are being met can assist in determining the effectiveness of a grazing system. Because livestock and wildlife grazing affects growth and reproduction of vegetation, the BLM monitors plant community composition and cover to determine if site-specific vegetative objectives are being met. The level and frequency of monitoring by allotment varies across the planning area. The BLM categorizes allotments into I (improvement), M (maintenance), and C (custodial). Generally, allotments in category I require more frequent monitoring than allotments in the other categories.

Since 2000, the BLM has assessed more than 500 upland sites, approximately 360 miles of streams (i.e., lotic{ XE "Lotic" } reaches), and more than 100 springs{ XE "Spring" } (i.e., lentic{

XE "Lentic" } sites), using primarily qualitative ratings, based on professional judgment. Assessments may be single site visits, or sites may be revisited, based on condition or impacts from continued uses or to assess the success of actions taken to correct ongoing or past issues. The BLM also conducts quantitative trend monitoring at 284 Long-Term Trend Sites, 558 IIRLH Sites, 126 AIM{ XE "Assessment, Inventory, and Monitoring (AIM)" } points, 65 Stewardship Monitoring Sites, and 89 Restoration Monitoring Sites.

Additional assessments are required on NPS-managed lands in Glen Canyon where GSENM administers grazing permits{ XE "Permit, Grazing" }. This is to ensure that park resources remain unimpaired, in accordance with the 54 USC, Section 100101(a) et seq., the Glen Canyon enabling legislation, NPS management policies, and the goals and objectives identified in the Glen Canyon GzMP{ XE "Grazing Management Plan, Glen Canyon (GzMP 1999)" } (NPS 1999). The NPS has established a long-term monitoring protocol for allotments in Glen Canyon. NPS monitors upland vegetation, based on Natural Resources Conservation Service (NRCS) Ecological Sites, using permanently located plots with three 50-meter transects, along which point count data are collected for plants, substrate, and BSC. In addition, 30 1- by 1-meter quadrats are placed along the transects to count exotic species{ XE "Exotic Species" } and native perennial{ XE "Perennial" } grasses. Soil features and BSC are also sampled by the slake test, penetrometer, and chain test.

Utilization{ XE "Utilization" }

Utilization{ XE "Utilization" } measurements estimate the amount of vegetation removed during a grazing period by both livestock and wildlife and are used to help explain observed vegetation changes. The measurements do not indicate whether this use has a negative or positive effect on the forage resource. The BLM measures utilization using key species (referred to as the Key Species Method in Interagency Technical Reference TR-1734-3, Utilization Studies and Residual Measurements [Forest Service and BLM 1996]), which may vary by allotment or pasture.

Trend

Trend is a transition toward or away from management goals or desired plant community. The BLM uses two methods to monitor long-term trend in the planning area. One is the photo plot method and the other is the frequency method. Both provide information on the trend of the observed plant community.

GSENM is currently implementing updated BLM monitoring, which combines historic frequency monitoring with the AIM{ XE "Assessment, Inventory, and Monitoring (AIM)" } method. The AIM method includes a broader suite of monitoring protocols (Toeves et al. 2011).[5] The NPS has additional monitoring protocols in place to provide quantitative data on vegetation and soils.

Assessment, Evaluation, Determination

In accordance with BLM Handbook H-4180-1, Rangeland Health{ XE "Rangeland Health" } Standards (BLM 2001), and IM 2009-007, the BLM, including GSENM, uses the procedures

[5] Additional information on the BLM AIM{ XE "Assessment, Inventory, and Monitoring (AIM)" } strategy can be found at the following website: http://www.blm.gov/wo/st/en/prog/more/Landscape_Approach.html.

below for evaluating land health, making determinations, and developing appropriate actions that will make significant progress toward achieving land health standards developed in accordance with 43 CFR, Subpart 4180.2(c). For allotments administered by GSENM in Glen Canyon, the NPS is involved in developing and reviewing the evaluation report and determination document. It may take different actions than those of the BLM in order to meet agency requirements.

The following summary of the evaluation process is primarily meant to describe the process for BLM-managed lands:

<u>Evaluation Report Assessing Land Health</u>

- Identify assessment areas to be evaluated for achieving land health standards. The evaluation should be completed primarily at higher levels, such as watersheds, landscapes, and groups of allotments.
- Prioritize areas for evaluation. Chapter III of BLM Handbook H-4180-1, Rangeland Health{ XE "Rangeland Health" } Standards, provides direction for selecting the area to be assessed and evaluated (BLM 2001).
- Assemble existing information, e.g., monitoring data, inventory data, and actual use information.
- Evaluate data to ascertain whether land health standards are achieved. If additional information is needed to draw conclusions about the achievement of standards, use Technical Reference 1734-6, Interpreting Indicators of Rangeland Health{ XE "Rangeland Health" } (Pellant et al. 2005), or collect additional monitoring data.
- Prepare an evaluation report to document whether land health standards are achieved. The report can be helpful to identify the appropriate action needed to make significant progress toward achieving the standards where they are not met.

The NPS also uses long-term quantitative monitoring plot data. The data are used to inform grazing management to protect values and purposes of Glen Canyon, in coordination with the BLM. It will document the methods, schedules, and adaptive management in the grazing monitoring plan it is developing.

If all land health standards are achieved or the status of some are unknown, no determination document needs to be completed. Handbook H-4180-1 (BLM 2001) gives general guidance for size, compatibility, continuity, and appropriate scale for conducting assessments. It also gives the BLM Authorized Officer discretion in selecting assessment unit boundaries and priorities. There may be a number of small areas that the BLM has not assessed but that the BLM Authorized Officer determined were not significant enough to be assessed. The BLM does not determine whether or not these areas achieve standards, but the areas may be included in a larger more significant unit (pasture or allotment) found to be achieving or not achieving land health standards.

An evaluation report must clearly state the rationale for finding that standards are achieved. The evaluation report will provide the following:

- Identify the area evaluated

- Reference information sources used in the evaluation
- Summarize the data used to ascertain whether standards are achieved
- List standards and objectives evaluated, indicators used to evaluate whether standards are achieved, and conclusions drawn by the interdisciplinary team

If the evaluation report documents that standards are not achieved in the assessment area, then the BLM Authorized Officer needs to determine significant causes for it. If existing grazing management practices or levels of grazing use on public land are significant factors, then the BLM must develop and implement an appropriate action, in accordance with 43 CFR, Subpart 4180.2(c). On NPS-managed lands, various causal factors{ XE "Causal Factor" } might trigger management actions, even if the factors are not significant.

On the lands that it manages, the NPS can consider modifications to grazing administration. This would come about if such changes would help protect park values and purposes in response to a variety of factors, including those beyond management control, such as drought.

The following process is used to determine and document causal factors{ XE "Causal Factor" } in assessment areas where land health standards are not achieved. The process also is used to select the appropriate action to take when existing grazing management or levels of grazing use are significant factors for not achieving the standards.

<u>Determination Document   Identifying Causal Factors</u>

- Review the conditions responsible for why the standards are not met.
- Ascertain whether the trend is toward achieving the land health standard. If the apparent trend is determined without monitoring data, the interdisciplinary team must document the indicators and rationale for the conclusion on the trend. This conclusion needs to be related to the standards not achieved.
- Review the uses and levels of use made in the area that is not achieving standards. Review existing grazing management practices for conformance with guidelines developed by BLM state directors in consultation with resource advisory councils and in accordance with 43 CFR, Subpart 4180.2. In order to determine if other activities are significant factors for not achieving land health standards, review them to see if they conform with or deviate from appropriate management practices for those activities.
- As directed in H-4180-1, Chapters III and VI, coordinate and consult with the permittees and interested parties to identify changes in grazing management or other activities that would make significant progress toward achieving land health standards. Several possible actions may produce a desirable outcome; analyze them in a NEPA{ XE "National Environmental Policy Act (NEPA)" } document to identify which are the most helpful. The NEPA document will indicate that the need for the proposed action and alternatives analyzed is to achieve land health standards and that the purpose is to make significant progress toward achievement of the standards.
- Incorporate this analysis information into the determination document.

Once the determination document is completed, the BLM Authorized Officer issues decisions to change management, as necessary. If existing grazing management or levels of grazing use are determined to be significant causal factors{ XE "Causal Factor" } for not achieving land health standards, the BLM Authorized Officer will issue a decision to modify grazing, construct management facilities, or implement treatments, in accordance with 43 CFR, Part 4160. As described in BLM IM 2002-124, "appropriate action" under 43 CFR, Subpart 4180.2(c), has been taken when the decision to implement the action is issued. If the significant causal factors are a result of BLM-authorized activities other than grazing, the BLM Authorized Officer will correct the situation, in accordance with regulations applicable to that activity. Decisions relating to livestock grazing administration by the BLM in Glen Canyon are made in consultation with the NPS.

If the causal factor{ XE "Causal Factor" } is an activity or event outside of the BLM's control (e.g., naturally occurring elements in soils, or flooding or wildfire that causes landscapes to not meet standards), no action is required. However, this may provide an opportunity to achieve management that will remedy the factors causing the land health standards to not be achieved on public land. In addition, the BLM should monitor the activity to determine if there is significant progress toward meeting the standards. On NPS-managed lands, action would be taken to alleviate unacceptable impacts, even if the causal factor is an activity or event outside of the BLM's or NPS's control.

In summary, a determination document will be completed only where land health standards are documented as "not achieved" in the evaluation report. Determination documents should not be signed for areas identified as not meeting standards until the following has been achieved:

- Causal factors{ XE "Causal Factor" } are listed
- Conformance with grazing administration guidelines or appropriate management practices for other activities have been reviewed
- Where needed, potential appropriate actions are identified

Monitoring to determine if actions taken are resulting in significant progress toward achieving the standards is a high priority. Monitoring is related to the indicators that were used to ascertain why the standards have not been achieved.

3.1.1 Current Conditions

Allotments

There are 96 allotments or areas in the decision area, 90 of which (1,855,400 acres) are wholly or partially within GSENM (see Figure 3-1~~Figure 3-1~~, Livestock Grazing Allotments). The are wholly or partially in GSENM are as follows:

Alvey Wash	Antone Flat	Big Bowns Bench	Big Horn
Black Ridge	Black Rock	Boot	Boulder Creek
Bull Run (State)	Bunting Trust (State)	Bunting Well	Calf Pasture

Circle Cliffs	Clark Bench	Cockscomb	Collet
Cottonwood	Coyote	Death Hollow	Deer Creek
Deer Range	Deer Spring{ XE "Spring" } Point	Dry Hollow	Dry Valley
Escalante River	First Point	Five Mile Mountain	Flag Point
Flood Canyon	Ford Well	Fortymile Ridge	Granary Ranch
Harvey's Fear	Haymaker Bench	Headwaters	Hells Bellows
Johnson Canyon	Johnson Lakes	Johnson Point	King Bench
Lake	Last Chance	Little Bowns Bench	Locke Ridge
Long Canyon Stock Driveway	Long Neck	Lower Cattle	Lower Hackberry
Main Canyon	McGath Point	Meadow Canyon	Mollies Nipple
Moody	Mud Springs{ XE "Spring" }	Muley Twist	Navajo Bench
Neaf	Nipple Bench	No Man's Mesa	Phipps
Pine Creek	Pine Point	Rattlesnake Bench	Rock Creek-Mudholes
Rock Reservoir	Round Valley	Roy Willis	Rush Beds
Salt Water Creek	School Section	Second Point	Sink Holes
Slick Rock (State)	Soda	Spencer Bench	Steep Creek
Swallow Park	Timber Mountain	Upper Cattle	Upper Hackberry
Upper Paria	Upper Warm Creek	Varney Griffin	Vermilion
Wagon Box Mesa	Wahweap	White Rock	White Sage
Willow Gulch	Wire Grass		

Figure 3-1 Livestock Grazing Allotments

Of the 96 allotments or areas in the decision area, 20 (318,800 acres) are wholly or partially in Glen Canyon (see Figure 3-1~~Figure 3-1~~). The BLM administers the permits on these allotments in accordance with two instruments: the enabling legislation for Glen Canyon and a memorandum of understanding and interagency agreement between the BLM and the NPS (see **Section 1.3.1**, Livestock Grazing Administration in Glen Canyon~~ National Recreation Area~~). are as follows:

Big Bowns Bench	Escalante River	Fortymile Ridge	Harvey's Fear
Lake	Lake Powell	Last Chance	Lower Cattle
Lower Warm Creek	Moody	Navajo Bench	Nipple Bench
Rock Creek-Mudholes	Soda	Spencer Bench	Unalloted areas
Upper Cattle	Upper Warm Creek	Wagon Box Mesa	Wire Grass

Twenty allotments (65,500 acres) are wholly or partially within the BLM KFO (see Figure 3-1~~Figure 3-1~~). GSENM has decision-making authority for allocation decisions related to the e allotments. It also administers the permits in conformance with the Kanab RMP (BLM 2008a). These allotments are as follows:

Alvey Wash	Big Horn	Black Rock	Clark Bench
Deer Spring{ XE "Spring" } Point	Dry Valley	Five Mile Mountain	Ford Well
Hall Ranch	Hells Bellows	Johnson Canyon	Mollies Nipple
Neaf	Pine Creek	Pine Point	South Fork
Upper Paria	Varney Griffin	White Sage	Wide Hollow

The Sink Holes allotment (2,300 acres) is partially within the BLM ASFO. The BLM GSENM has decision-making authority for allocation decisions related to this allotment; it administers the permit in conformance with the Arizona Strip RMP (BLM 2008b). The BLM ASFO administers the Rock Reservoir allotment and Coyote allotment in GSENM (Figure 3-1~~Figure 3-1~~).[6]

Available Allotments and Areas and AUMs

Eighty-four of the 96 allotments or areas, totaling 2,089,000 acres, are wholly or partially available for livestock grazing. This includes 35,400 acres that are unalloted for livestock grazing (1,600 acres in Glen Canyon). Livestock grazing could be authorized in unalloted areas, but they currently do not have any grazing allocated. The ~~total grazing preference~~{~~ XE "Preference, Grazing" ~~}maximum number of permitted AUMs in the decision area is 106,202~~ AUMs~~. This includes 76,957 active AUMs (including from forage reserves) and 29,245 suspended{ XE "Suspension" } AUMs. The suspension of AUMs is primarily the result of allotment land health evaluations, changes in allotment management, and allocation adjustments made during the

[6] There are two Coyote allotments, one administered by the BLM ASFO and the other by the BLM GSENM.

establishment of allotment management plans{ XE "Allotment Management Plan" } or other planning efforts conducted for allotments now administered by GSENM. These suspensions primarily occurred by decisions prior to establishment of GSENM. See **Table 3-1**, Summary of Allocations for Livestock Grazing, for acres available by administrative unit and a summary of AUMs.

Table 3-1
Summary of Allocations for Livestock Grazing

Acres Available for Livestock Grazing	Acres
GSENM	1,791,100
Glen Canyon	230,100
Kanab Field Office	65,500
Arizona Strip Field Office	2,300
Summary of AUMs for Decision Area	**AUMs**
~~Total grazing preference~~{ ~~XE "Preference, Grazing"~~ }Maximum permitted	106,202
Active AUMs	76,957
Suspended{ XE "Suspension" } AUMs	29,245

Source: BLM GIS 2014

Of the allotments that are available for livestock grazing, 79 have active permits. There are 91 permittees authorized to graze cattle and horses on these allotments. Little Bowns Bench allotment (130 AUMs), the Wolverine pasture of the Deer Creek allotment (148 AUMs), and the Phipps pasture of the Phipps allotment (140 AUMs) total 14,600 acres. They are designated as forage reserves (BLM 1999) and together can supply up to 418 AUMs in emergency situations. No 10-year permit is issued to a holder of preference for these areas. Four allotments (Antone Flat, Long Canyon Stock Driveway, Varney Griffin, and an area in Glen Canyon) do not have an associated grazing preference{ XE "Preference, Grazing" }. A total of 2,089,000 acres are available for livestock grazing.

Table 3-2, Active Allotments Available for Livestock Grazing and Associated Use~~Active Allotments Available for Livestock Grazing and Associated Use~~, displays the active use, the associated season of use, and the actual use. The data for each of the 79 active allotments available for livestock grazing are from 1996, when GSENM was established, to 2013, the most recent year of data collected and processed. Actual use means where, how many, and what kind or class of livestock and how long livestock graze on an allotment or on a portion or pasture of an allotment (43 CFR, Subpart 4100.0-5). The permittee is required to submit this information at the end of the season of use of the allotment.

Livestock use is authorized at different times and seasons throughout the year. Season-of-use is largely determined by elevation. Generally, livestock graze the lower elevation allotments during the winter and spring{ XE "Spring" }, the mid-elevation allotments during the spring and fall, and the high elevation allotments in the summer. Most permittees do not graze their livestock in the decision area year-round; at least part of the year, most graze their livestock on lands not managed by the BLM, such as National Forest System lands, private base property, or state lease. Those allotments, which do have livestock use permitted year-round, include pastures in

which the livestock are rotated so as not to graze on the same portion of the allotment yearlong. The annual stocking rate{ XE "Stocking Rate" }, based on the carrying capacity for each allotment, is typically determined before stock are turned out at the beginning of the season of use.

Table 3-2
Active Allotments Available for Livestock Grazing and Associated Use

Allotment	Season of Use	Acres in Decision Area	Active Use (AUMs)	Actual Use[1] (AUMs) Five-Year Average 1996-2000	2001-2005	2006-2010	2011-2014[2]	19-Year Average (1996-2014)
Alvey Wash	May 15 – September 30	60,185	1,424	1,476	807	682	356	855
Big Bowns Bench*	November 1 – March 31	16,839	750	857[3]	*Nonuse*	*Nonuse*	*Nonuse*	180[3]
Big Horn	November 1 – June 15	50,215	3,515	2,426	1,366	1,102[3]	2,272[3]	1,738[3]
Black Ridge	November 1 – May 31	11,657	903	438	390	315	318[3]	371[3]
Black Rock	June 6 – October 16	9,310	408	758	651[3]	153[3]	221[3]	458[3]
Black Rock (State)	June 6 – October 16	1,251	64	*Actual use averages are included in the Black Rock section.*				
Boot	August 1 – October 31	2,675	45	45	29[3]	42	45	40[3]
Boulder Creek	September 1 – December 31	3,251	80	48[3]	26[3]	8[3]	14[3]	25[3]
Bull Run (State)	July 1 – February 28	631	5	*No use of the allotment since the BLM acquired it in 1998.*				
Bunting Trust (State)	May 15 – November 30	226	16	10[3]	11	17	22	16[3]
Calf Pasture	June 10 – August 10 *(even years)* August 10 – October 15 *(odd years)*	2,775	176	67	34	76	60	59
Circle Cliffs	November 1 – March 31	30,212	1,050	842	43	402	874[3]	503[3]
Clark Bench	November 1 – April 30	25,170	1,238	894	330	344	293	474
Cockscomb	March 1 – May 31	2,753	36	14	18	8	21	15
Collet	June 16 – September 15	16,723	97	95[3]	72	84	77	79[3]
Cottonwood	November 1 – May 31	103,326	3,188	2,656	1,692	2,121	2,348[3]	2,188[3]
Coyote	November 1 – May 31	32,636	2,044	1,594	650	1,331	943[3]	1,150[3]
Death Hollow	November 1 – March 31 April 1 – May 15	19,538	1,057	607	210	541	712[3]	496[3]
Deer Creek	November 1 – February 28	8,991	358	344	103	45	91	149

Table 3-2
Active Allotments Available for Livestock Grazing and Associated Use

Allotment	Season of Use	Acres in Decision Area	Active Use (AUMs)	Actual Use[1] (AUMs) Five-Year Average 1996-2000	2001-2005	2006-2010	2011-2014[2]	19-Year Average (1996-2014)
Wolverine Pasture (forage reserve)	October 1 – March 31	3,816	148				117	
Deer Range	August 1 – October 15	11,107	231	194		42	92	103
Deer Spring{ XE "Spring" } Point	June 10 – October 17	24,986	585	499	229	164	206	278
Dry Valley	March 1 – December 31 March 1 – January 31 July 1 – October 31	11,448	699	672	449	576	635	580
First Point	June 1 – December 31	3,015	410	132	69	41	*Nonuse*	76
Five Mile Mountain	November 1 – April 30	17,848	385	380	51	13	*Nonuse*	97
Flood Canyon	July 1 – October 31	13,576	148	63	22	30	62	43
Ford Well	June 10 – October 9	9,088	300	256	242	44	267[3]	176
Fortymile Ridge*	October 15 – May 31	57,905	4,290	2,582	1,291	3,713	2,703[3]	2,558[3]
Granary Ranch	July 1 – November 30	1,905	70	7	41	30	42	29
Hall Ranch	March 1 – February 28	34	12	*Nonuse*[3]	*Nonuse*	11.5[3]	8[3]	8[3]
Haymaker Bench	November 1 – February 28	3,150	100	58	70	61	76[3]	65[3]
Headwaters	November 1 – March 15	154,436	3,469	3,393	1,981	1,991	2,578	2,480
Hells Bellows	May 1 – October 15	2,132	44	44	32	35	42[3]	36
Johnson Canyon	June 1 – November 15	10,121	274	165	111	67	127	117
Johnson Lakes	June 1 – November 30	11,142	347	306	179	112	286	217
Johnson Point	November 1 – March 31	2,344	135	*Nonuse*	10	*Nonuse*	*Nonuse*	3
King Bench	November 1 – March 31	54,328	1,515	1,144	980	311	1,315[3]	895[3]
Lake*	June 1 – September 30	22,741	1,310	1,116	80	485	320	510
Lake Powell*	October 15 – March 15	367	20			*Nonuse*		
Last Chance*	March 1 – February 28	250,120	4,642	2,672	1,015	967	961	1,427

Table 3-2
Active Allotments Available for Livestock Grazing and Associated Use

Allotment	Season of Use	Acres in Decision Area	Active Use (AUMs)	Actual Use[1] (AUMs) Five-Year Average 1996-2000	2001-2005	2006-2010	2011-2014[2]	19-Year Average (1996-2014)
Little Bowns Bench (forage reserve)	October 1 – March 31	3,422	130				141	
Locke Ridge	December 1 – April 30	4,456	172	118	134	78[3]	98[3]	110[3]
Lower Cattle*	October 1 – April 15	81,350	7,488	4,680	3,514	5,294	4,342[3]	4,470[3]
Lower Hackberry	October 15 – March 15	20,173	435	222	67	152	446	186
Lower Warm Creek*	November 1 – March 31	15,920	225	80	100	*Nonuse*	59	59
Main Canyon	June 1 – September 30	312	14	8[3]	10	53	6	21[3]
Meadow Canyon	September 1 – November 30	4,681	144	135	103	79[3]	95	108[3]
Mollies Nipple	March 1 – February 28	102,361	3,880	3,785	2,784	2,874	2,621[3]	3,059[3]
Moody*	November 1 – March 31	43,272	909	712	391	270	401[3]	451[3]
Mud Springs{ XE "Spring" }	July 15 – October 15	15,652	277	214	200	79	97	150
Neaf	March 1 – November 30	1,287	9	7	*Nonuse*	2	*Nonuse*	3
Nipple Bench*	December 1 – April 30	30,459	1,042	349	311	361	437[3]	357[3]
Phipps (Phipps pasture; forage reserve)	October 1 – March 31	7,365	140				122	
Pine Creek	September 16 – October 31	3,804	144	60	78	7	105[3]	58[3]
Pine Creek (State)	November 1 – January 31	592	27	*Actual use averages are included in the Black Rock section.*				
Pine Point	June 16 – October 15	8,828	365	245	169	108	168	173
Rock Creek-Mudholes*	March 1 – February 28	64,873	2,173	1,381	*Nonuse*	954	1,348[3]	873[3]
Round Valley	November 1 – March 31	9,920	522	419	253	316	298	322

Table 3-2
Active Allotments Available for Livestock Grazing and Associated Use

Allotment	Season of Use	Acres in Decision Area	Active Use (AUMs)	Actual Use[1] (AUMs) Five-Year Average 1996-2000	2001-2005	2006-2010	2011-2014[2]	19-Year Average (1996-2014)
Roy Willis	November 1 – March 15	195	9	2	4	4	9	4
Rush Beds	November 1 – April 30	18,765	252	38	126	76	118[3]	92[3]
School Section	May 1 – April 30	753	102	30[3]	37	15[3]	29[3]	29[3]
Second Point	August 1 – September 30	5,890	98	52	18	19[3]	9	26[3]
Sink Holes	November 1 – April 1	6,589	154	110	*Nonuse*	8[3]	82[3]	49[3]
Slick Rock (State)	June 1 – June 30	643	24	*Insufficient data*	*Insufficient data*	15	6	10[4]
Soda*	October 1 – May 31	70,445	2,798	1,744	642	2,230	1,001[3]	1,449[3]
South Fork	March 1 – February 28	118	12	*Nonuse*	*Nonuse*	9	8	4[3]
Swallow Park	May 1 – October 31	16,494	1,076	621	509	514	387	514
Timber Mountain	June 16 – October 15	7,662	426	287	223	174	96	200
Upper Cattle*	November 1 – June 15	92,420	8,158	5,606	4,774	7,276	4,598	5,671
Upper Hackberry	November 1 – March 31 April 16 – June 15	22,835	654	472	270	217	343[3]	323[3]
Upper Paria	May 1 – June 10 May 1 – September 30	94,347	2,833	2,277	738	1,282	1,396	1,425
Upper Warm Creek*	November 1 – May 31	77,363	1,638	364	401	682	609[3]	503[3]
Vermilion	February 16 – February 28, 2014 March 1 – May 15 June 1 – September 15 October 1 – January 15	43,084	2,849	2,080	1,104	416	814[3]	1,136[3]
Wagon Box Mesa*	November 1 – March 31	28,995	637	267	248	201	244[3]	240[3]
Wahweap	December 1 – April 30	17,222	491	361	206	224	415	289[3]
White Rock	December 1 – January 31	1,389	60	55	47	23	*Nonuse*[3]	35[3]

Table 3-2
Active Allotments Available for Livestock Grazing and Associated Use

Allotment	Season of Use	Acres in Decision Area	Active Use (AUMs)	Actual Use[1] (AUMs) Five-Year Average 1996-2000	2001-2005	2006-2010	2011-2014[2]	19-Year Average (1996-2014)
White Sage	May 6 – June 5	2,142	76	64	33	15	*Nonuse*	31
Wide Hollow	October 1 – December 31	3,779	353	265[3]	118	354	261	248[3]
Willow Gulch	November 1 – March 31 December 1 – January 31	12,214	474	188	22	28	18[3]	69[3]
Wiregrass*	November 1 – March 31	19,865	99	342	3	*Nonuse*	16	102

Sources: BLM undated

[1]Actual use is supplemented with billed use where actual use data is not available.
[2]2011-2013 actual use averages are for a three-year period.
[3]Period includes years with nonuse. Some data for 2013 are not available and so could not be included in the averages.
[4]Based on eight-year average
*Allotment partially or wholly in Glen Canyon

The level of grazing use within the planning area continues to be at or below permitted (active use) levels. Some of the major factors that typically affect or determine the number of grazing livestock on an allotment in any given year are listed below.

- Precipitation   The timing, intensity, and amount of precipitation received, or the prolonged absence thereof (i.e., drought), before livestock are turned out determines forage production more than any other factor.
- Temperature   Temperature can have a positive or negative effect on forage growth rates. For example, a cold, dry spring{ XE "Spring" } generally limits growth on cool season grasses. This relates to the concept of range readiness, which is a defined stage of plant growth at which grazing may begin without permanent damage to vegetation or soil.
- Availability of livestock water or snow   This plays an important role in how long an area is used and when it is used. There can be plenty of forage, but if there is no available water, that area cannot be used.
- Conservation   Protecting the rangeland is often a choice by permittees, who are familiar with their allotments and often recommend or suggest that an area or allotment should receive less grazing use.
- Individual permittee's preference in relation to livestock operations   A permittee may decide not to run allocated numbers in a particular year.
- Restoration/revegetation work   At times, the BLM has asked that the permittees not graze an area or allotment while restoration work is taking place. This is usually documented in a signed agreement. The minimum lengths of time these areas have been rested is two growing seasons, but they may be rested longer, depending on resource objectives and condition.

Unavailable Allotments and Areas

Seventeen of the 96 allotments or areas in the decision area, totaling 153,000 acres, are wholly or partially unavailable to livestock grazing. This includes 88,700 acres in Glen Canyon. **Table 3-3**, Summary of Allotments or Areas Unavailable for Livestock Grazing, displays the allotments or the portions of allotments that are not available for livestock grazing.

In 1964, the BLM made unavailable the Lower Calf Creek Falls pasture of the Willow Gulch allotment because of the construction of the Calf Creek recreation site and campground. The trail to the lower falls is used almost daily year-round and often has hundreds of visitors hiking to the falls during the high-use period. This is the highest concentrated recreation use area in GSENM.

The Harvey's Fear, Navajo Bench, and Spencer Bench areas are on a relatively narrow bench between the top of Fiftymile Mountain and Lake Powell. They surround the southern tip of Fiftymile Mountain. These areas are difficult to access due to cliffs both above and below. Limited access, water, and forage make these areas unsuitable for grazing. In both the 1980 Grazing EIS and subsequent 1981 Paria MFP, the BLM recommended continuing the closure (BLM 1980a, 1981a).

Table 3-3
Summary of Allotments or Areas Unavailable for Livestock Grazing

Acres Unavailable for Livestock Grazing	Acres
GSENM	64,300
Glen Canyon	88,700
Kanab Field Office	0
Arizona Strip Field Office	0
Allotment (Pasture) Unavailable for Livestock Grazing	**Acres**
Antone Flat	15,000
Big Bowns Bench (River pasture* and a portion of Horse Canyon pasture)	2,100
Deer Creek (Cottonwood and River pastures)	5,200
Dry Hollow	1,300
Escalante River*	59,300
Harvey's Fear*	4,300
Long Neck	230
McGath Point	3,100
Muley Twist	2,200
Navajo Bench*	12,900
Phipps (River Pasture)	3,100
Rattlesnake Bench	3,600
Rock Creek-Mudholes (Dry Rock Creek and Middle Rock Creek pastures)*	11,900
Saltwater Creek	12,100
Spencer Bench*	8,500
Steep Creek	7,600
Willow Gulch (Lower Calf Creek Falls pasture)	670
Total	*153,000*

Sources: BLM undated; BLM GIS 2014
*Allotment partially or wholly in Glen Canyon

The BLM made the Muley Twist area, in the far northeast corner of the planning area, unavailable for livestock grazing in 1981. This was due to a management decision associated with Capitol Reef National Park (BLM 1981b).

The BLM made the Dry Rock Creek and Middle Rock Creek pastures (Rock Creek-Mudholes allotment) unavailable by decision in the Escalante MFP (BLM 1981b). This was due to slope and topography, lack of access, and limited forage. Dry Rock Creek, the larger pasture, has been mostly cut off from other areas due to the formation of Lake Powell.

The BLM put the Dry Hollow allotment into nonuse through a decision in the 1981 Escalante MFP (BLM 1981b).

The BLM made the Rattlesnake Bench allotment unavailable by decision in the 1981 Escalante MFP due to suitability issues, such as access, terrain, limited forage, and lack of water.

In the 1999 Escalante MFP amendment, the BLM made the portion of the Big Bowns Bench (698 AUMs), Deer Creek (83 AUMs), and Phipps (140 AUMs) allotments next to the Escalante River unavailable to grazing (BLM 1999). The NPS portion of the Escalante River was closed through plan amendment in this same amendment. The BLM also made unavailable the McGath Point, Salt Water Creek, and Steep Creek allotments and the Cottonwood pasture (Deer Creek allotment) to livestock grazing in the 1999 Escalante MFP amendment (BLM 1999). The reason for closure was to eliminate conflicts between recreationists and livestock and also to protect and enhance riparian, wildlife, fisheries, and watershed values of the Escalante River and some tributaries.

In a 1999 plan amendment, the BLM designated the Little Bowns Bench allotment, Phipps pasture (Phipps allotment), and Wolverine pasture (Deer Creek allotment) as reserve common allotments{ XE "Reserve Common Allotment" }. The forage in these areas could be used in times of forage loss elsewhere due to drought, fire, or disease.

Rangeland Health{ XE "Rangeland Health" } Standards

Between 1999 and 2006, the BLM conducted rangeland health{ XE "Rangeland Health" } assessments{ XE "Rangeland Health, Assessment" } on soil mapping units that made up approximately 75 percent of the geographic area of each pasture in each allotment. At the discretion of the interdisciplinary team, the BLM assessed additional areas above the 75 percent level if livestock frequently used those areas. These assessments were primarily qualitative ratings, based on professional experience and ecological site description{ XE "Ecological Site" }s. The assessments were not done on a random sampling basis, but at locations that, in the opinion of the team, were representative of larger areas. Each assessment location was about 0.5 to 1 hectares (1 to 2 acres (Miller 2008).

The BLM completed a GSENM-wide evaluation in 2006 to determine the status of rangeland health{ XE "Rangeland Health" } in each of the allotments. The agency determined that 21 allotments were not meeting one or more rangeland health standards due to existing livestock grazing. **Table 3-4**, Allotments Not Meeting Rangeland Health{ XE "Rangeland Health" } Standards and Actions Taken Since 2006~~Allotments Not Meeting Rangeland Health{ XE~~ of these allotments.

For 19 of the 21 allotments not meeting rangeland health{ XE "Rangeland Health" } standards, the BLM determined that "1) existing grazing management or levels of grazing use are significant factors in failing to achieve the [rangeland health standards] or conform with the guidelines [for livestock grazing management] and 2) existing grazing management needs to be modified to ensure that the fundamentals of rangeland health{ XE "Range Land Health, Fundamental of" } are met, or making significant progress toward being met" (BLM 2006). While livestock grazing was determined to be part of the problem in not meeting one or more of the land health standards, it was not always the primary causal factor{ XE "Causal Factor" } in not meeting all of the standards.

For the remaining two allotments not meeting rangeland health{ XE "Rangeland Health" } standards due to livestock grazing, existing grazing management, or levels of grazing use was not a significant factor in failing to achieve the standards. The causal factors{ XE "Causal Factor" } identified were past grazing practices (more than 10 years earlier than the evaluations) and the

inability of the rangelands to recover from past grazing management or levels of use. However, in order to meet or make significant progress toward meeting the fundamentals of rangeland health{ XE "Range Land Health, Fundamental of" }, the BLM determined that existing grazing management should be modified.

Since the 2006 determination, additional PFC assessments have been conducted in the following allotments: Circle Cliffs, Collet, Cottonwood, Death Hollow, First Point, Ford Well, Fortymile Ridge, Headwaters, Hells Bellows, Lake, Last Chance, Lower Cattle, Mollies Nipple, Rock Creek-Mudholes, Soda, Swallow Park, Upper Paria, and Vermilion. Additional upland assessments have been conducted in the Fortymile Ridge, Lower Cattle, Mollies Nipple, School Section, Soda, and Vermilion allotments. Overall, most of the riparian and wetland{ XE "Wetland" } sites evaluated showed an improvement. Assessments completed and changes to grazing management are described in **Table 3-4**.

Commented [BB1]: Cindy: please insert Table 3-4 after this line no matter what

Table 3-4
Allotments Not Meeting Rangeland Health{ XE "Rangeland Health" } Standards and Actions Taken Since 2006

Allotment	Standard Not Met				Changes to Grazing Management[1]	Assessments Since 2006 Determinations
	1	2	3	4		
Circle Cliffs	X	X	X		• Restored the Lampstand, Onion Beds, and Prospect pasture seedings{ XE "Seeding" } (2,500 acres) • Limited grazing use in the Gulch pasture no later than March 15	PFC assessments 2007, 2012
Collet		X	X		• Increased use supervision to control unauthorized livestock • Coordinated 28 percent voluntary nonuse to meet BLM resource objectives (2007-2013)	PFC assessments 2012
Cottonwood		X		X[2]	• Upgraded and maintained the Coyote well, pipeline, and associated infrastructure • Maintained Jack Riggs and Butler Valley water systems • Voluntary nonuse of the riparian pasture to trailing and emergency use • Restored the Eight Mile seeding{ XE "Seeding" } (2008-2009) • Installed solar pump on Butler Valley well (2012) • Implemented two separate experimental rotation systems	PFC assessments 2007, 2010, 2013, 2014
Coyote	X		X	X[2]	• Restored 2,634 acres of seeded pasture (2009) • Coyote well, pipeline, and	Restoration monitoring conducted annually for first five years after

Table 3-4
Allotments Not Meeting Rangeland Health{ XE "Rangeland Health" } Standards and Actions Taken Since 2006

Allotment	Standard Not Met				Changes to Grazing Management[1]	Assessments Since 2006 Determinations
	1	2	3	4		
					infrastructure upgraded and maintained	project completion
Death Hollow		X			• 100 percent voluntary nonuse to meet resource objectives (2006-2007); voluntary nonuse during spring{ XE "Spring" } in 2002-2006 and 2012 • Cleaned and reconstructed stock ponds between Wolverine and Horse Canyon (2008)	Riparian monitoring 2012; PFC assessments 2013
First Point		X			• Fenced First Point Spring{ XE "Spring" } to exclude livestock (2007) • Maintained off-site water at First Point Spring{ XE "Spring" }	PFC assessments 2007
Ford Well		X			• Fenced Old Corral Spring{ XE "Spring" } and Ford Well Spring to exclude livestock • Provided off-site water at both springs,{ XE "Spring" } improving distribution	PFC assessments 2007
Fortymile Ridge[3]		X		X[2]	• 22 percent voluntary nonuse to meet resource objectives (2006-2012) • Maintained spring{ XE "Spring" } protection fences (2008) • Maintained the Wilcox Spring{ XE "Spring" } protection fence • Returned a portion of the Wilcox Spring{ XE "Spring" } flow to spring to recover riparian vegetation (2010) • Used supplement to improve livestock distribution (2006 to present)	PFC assessments 2007, 2014 Upland assessments 2014
Headwaters		X		X[4]	• Implemented invasive weed management starting in 2001 • Changed season of use, livestock off on March 15 • Limited livestock use in the Wahweap "Box" riparian area{ XE "Riparian Area" }	PFC assessments 2010, 2014
Hells		X			• 100 percent voluntary nonuse in	PFC assessments 2007

Table 3-4
Allotments Not Meeting Rangeland Health{ XE "Rangeland Health" } Standards and Actions Taken Since 2006

Allotment	Standard Not Met				Changes to Grazing Management[1]	Assessments Since 2006 Determinations
	1	2	3	4		
Bellows					2007	
Lake[3]		X	X		• Removed more than 80 feral cattle • Maintained pasture and spring{ XE "Spring" } protection fences • Complete nonuse of the allotment from 2001-2003 and 2007	PFC assessment 2007
Last Chance[3]		X		X[4]	• 76 percent voluntary nonuse to meet resource objectives (2006-2012) • Removed feral cattle from the allotment (2003-present) • Maintained exclosure fence around Relishen Seep (2005)	PFC assessments 2010, 2014

Table 3-4
Allotments Not Meeting Rangeland Health{ XE "Rangeland Health" } Standards and Actions Taken Since 2006

Allotment	Standard Not Met				Changes to Grazing Management[1]	Assessments Since 2006 Determinations
	1	2	3	4		
Lower Cattle[3]		X	X		• 33 percent voluntary nonuse to meet resource objectives (2006-2012) • Implemented a water-controlled, deferred rest rotation grazing system to better manage livestock distribution (2007- present) • Maintained stock ponds to improve water availability and distribution • Used supplement to improve livestock distribution (2006 to present) • Used water-based rotation/distribution	PFC assessments 2007, 2013, 2014 Upland assessments 2014
Mollies Nipple	X	X	X		• Restored three seeded pastures • 27 percent voluntary nonuse to meet objectives (2006-2012) • Due to drought, made adjustment to livestock use • Administered deferred rest rotation • Maintained Seaman Wash pipeline (2007) • Fenced Wildcat Spring{ XE "Spring" } (2009). • Constructed water developments in the Buckskin pasture (Sink Hole and Buckskin catchments) • Maintained two stock ponds in Buckskin pasture 2007 • Fenced and restored springs{ XE "Spring" }	PFC assessments 2010, 2013 Upland assessments 2014
Nipple Bench[3]		X		X[4]	Livestock grazing is not the causal factor{ XE "Causal Factor" } for not meeting rangeland health{ XE "Rangeland Health" } standards. The road through the riparian area{ XE "Riparian Area" } is constricting the ability to move toward meeting standards.	N/A
Rock Creek-Mudholes[3]		X		X	• Removed more than 65 feral cattle (2006-2008)	PFC assessments 2015

Table 3-4
Allotments Not Meeting Rangeland Health{ XE "Rangeland Health" } Standards and Actions Taken Since 2006

Allotment	Standard Not Met 1	2	3	4	Changes to Grazing Management[1]	Assessments Since 2006 Determinations
					• Permittee removed more than 25 additional feral cattle (2009-present) • Maintained four spring{ XE "Spring" } fences • Maintained pasture fences • Implemented 100 percent nonuse to meet BLM resource objectives (2001-2006) • Coordinated partial voluntary nonuse (2007-present)	
School Section			X		• Implemented 100 percent nonuse to meet resources objectives (2007-2010) • Approximately 70 percent voluntary nonuse (2009-present)	Upland assessments 2013
Soda[3]	X	X			• Removed more than 45 feral cattle (2003-2004) • Maintained Cottonwood Spring{ XE "Spring" } protection fence (2010) • Maintained stock ponds and catchments (2011) • Maintained and improved Hole in the Rock well (2008) • 100 percent nonuse to meet objectives (2002-2005) • Ensured that rotational grazing system would be avoided after March 31 on consecutive years	PFC assessments 2013, 2014 Upland assessments 2014
Swallow Park		X			• In the Bullrush Hollow pasture voluntary season of use, deferring use in summer and critical spring{ XE "Spring" } growing season • Implemented voluntary partial nonuse to meet resource objectives (2001-2008)	PFC assessments 2010
Upper Paria	X	X		X[2]	• Repaired and maintained erosion control structures in the Mudholes pasture (2005) • Completed restoration on 300 acres of seeded pasture in the Mudholes and Upper Jim Hollow	PFC assessments 2010

Table 3-4
Allotments Not Meeting Rangeland Health{ XE "Rangeland Health" } Standards and Actions Taken Since 2006

Allotment	Standard Not Met				Changes to Grazing Management[1]	Assessments Since 2006 Determinations
	1	2	3	4		
					pastures (2005) • 39 percent voluntary nonuse to meet resource objectives (2003-2013) • Installed riparian spring{ XE "Spring" } protection fence at Between the Creeks Spring (2008) • Repaired and upgraded spring{ XE "Spring" } development and spring protection fence at Dick Ott Spring (2006) • Maintained and upgraded the Sheep Creek pipeline and cleaned Upper Jim stock ponds (2006) • Installed one acre monitoring exclosure in Mudholes seeding{ XE "Seeding" } for frequency/cover monitoring	
Vermilion	X	X	X	X	• Maintained Sand, Cole, and Nephi spring{ XE "Spring" } protection fences; restored spring boxes (2007) • Completed seeding{ XE "Seeding" } restoration in RCA 1, RCA 2, RCA 3, and Fossil Wash pastures (2006) • 81 percent voluntary nonuse to meet resource objectives (2006-2012) • Completed Sink Holes catchment in Government Reservoir pasture • Maintained Fossil Wash stock pond (2007)	PFC assessments 2012, 2013, 2014 Upland assessments 2014

Source: BLM 2006
[1]This list is not all inclusive but is intended to give the reader an indication of actions taken by the BLM and grazing permit{ XE "Permit, Grazing" }tees to make progress toward meeting rangeland health{ XE "Rangeland Health" } standards.
[2]Livestock grazing was determined not to be a cause in not meeting Standard 4.
[3]Allotment partially or wholly in Glen Canyon.
[4]Livestock grazing was determined to be a contributing factor{ XE "Contributing Factor" } in not meeting Standard 4.

Circle Cliffs Allotment. The actions taken on this allotment, such as the approximate 2,500 acres of vegetation treatments{ XE "Vegetation Treatment" }, have improved desired vegetative cover and composition, while reducing soil movement and erosion. This has resulted in progress

toward meeting Standards 1 and 3. Limiting spring{ XE "Spring" } use in the Gulch has reduced livestock-related impacts, such as trampling and utilization{ XE "Utilization" } of forage, during the critical spring growing season. This has resulted in progress toward meeting Standard 2 (2007, 2012 PFC assessments).

Collet Allotment. The actions taken on this allotment, such as voluntary nonuse and increased use supervision, have limited grazing impacts, such as trampling and bank shear, on the riparian area{ XE "Riparian Area" } in Right Hand Collet. These actions have resulted in significant progress toward meeting riparian health standards, as exhibited by riparian vegetation recruitment, increased plant vigor, and bank continuity.

Increased use supervision and management on the Collet allotment is a change from past practices. Improved management practices, including fence maintenance, have assisted in proper livestock control, providing improved riparian management and progress toward meeting standards.

Voluntary nonuse (28 percent) by the permittee has provided for proper levels of use of available forage. Reduced levels of use have improved vegetation conditions (cover, diversity, and vigor) and made progress toward meeting Standard 2 (2012 PFC assessments). In 2012, full numbers were authorized on the allotment, and utilization{ XE "Utilization" } data for key species was found to be in the Light Use Category (21 to 40 percent). This indicates that current authorized use numbers can provide for the continued recovery and integrity of the biotic community.

Cottonwood Allotment. The actions taken on this allotment have improved cattle distribution and reduced grazing impacts on riparian areas{ XE "Riparian Area" }. The BLM has implemented all of the actions identified in the 2006 Rangeland Health{ XE "Rangeland Health" } Determination plus has installed a solar pump on the Butler Valley well. Project work has provided for rotational grazing and lessened the dependency on the Paria River and Cottonwood drainages as water sources. The BLM has treated 1,174 acres of seeding{ XE "Seeding" } and sagebrush for rehabilitation. The BLM's and permittees' actions, such as improving the Coyote pipeline and limiting grazing in the Paria River and Cottonwood Creek riparian corridors, have reduced impacts on riparian areas and increased recovery periods. This has improved resource conditions and made progress toward achieving Standard 2 (2007, 2010, and 2014 PFC assessments). Standard 4 was not met due to natural background geologic and physiographic conditions unrelated to livestock grazing.

Coyote Allotment. The actions taken on this allotment, such as 2,634 acres of vegetation treatment{ XE "Vegetation Treatment" } and restoration, have improved desired vegetative cover, composition, and diversity. Soil stability has also been improved, as evident in reduced soil movement and erosion, resulting in progress toward meeting Standards 1 and 3. Standard 4 was evaluated as not being met due to natural geologic sources; this is not an issue that the BLM can resolve through management.

Death Hollow Allotment. The BLM has worked with the permittee to rest or defer use for 7 of the last 12 years. Consecutive nonuse for five years (2002 to 2006) has improved riparian conditions. An additional year of nonuse (2012) has also provided for recovery of the riparian

area{ XE "Riparian Area" } to maintain its condition. The permittee has agreed to implement a rotational deferment of the spring{ XE "Spring" } use on the allotment. Periodic growing season rest (deferment) is a common strategy of grazing systems. It can provide sufficient growth and recovery for systems, while improving or maintaining their condition without eliminating livestock use during the growing season. The reconstruction of stock ponds has increased their storage capacity and improved livestock distribution and management on the allotment. This has led to reduced use of the riparian areas and subsequent improvement.

First Point Allotment. The action taken on the First Point allotment included fencing First Point Spring{ XE "Spring" } and providing off-site water for grazing livestock. Protecting this riparian area{ XE "Riparian Area" } has improved riparian conditions, and the area is making progress toward meeting Standard 2.

Ford Well Allotment. Actions taken on the Ford Well allotment are similar to those that occurred on the First Point allotment. Old Corral Spring{ XE "Spring" } and Ford Well Spring have both been fenced, and off-site water has been provided for livestock. Riparian conditions have improved, thereby making progress toward meeting Standard 2.

Forty Mile Ridge Allotment. The BLM has completed maintenance of spring{ XE "Spring" } exclosure fences. Wilcox Spring was modified to maintain riparian vegetation at its source. Excluding livestock has improved the vegetation surrounding the springs and has made progress toward meeting Standard 2. Voluntary nonuse has decreased riparian utilization{ XE "Utilization" } levels, helping these areas to improve and make progress toward meeting Standard 2. The use of supplement, which draws livestock into less used areas of the allotment and away from riparian areas{ XE "Riparian Area" }, has improved livestock distribution. This has further lessened the use of riparian areas and addressed the recommendation to develop and relocate water sources to improve livestock distribution. Standard 4 was not met due to natural background geologic and physiographic conditions unrelated to livestock grazing.

Headwaters Allotment. Although the 2006 Rangeland Health{ XE "Rangeland Health" } Determination was that the Headwaters allotment did not meet or achieve Standards 2 and 4, past grazing practices were not the primary causal factor{ XE "Causal Factor" }. Under the current season of use, November 1 to March 15, progress continues to be made toward meeting Standard 2, as indicated by monitoring and PFC assessments. Additionally, the BLM has reduced use in riparian areas{ XE "Riparian Area" } in the Wahweap drainage. It has coordinated with permittees annually to properly stock the allotment, based on available forage. These actions are expected to improve water quality, making progress toward meeting Standard 4. The 2006 determinations also attributed geological and physiographic conditions as a contributing factor{ XE "Contributing Factor" } for not meeting Standard 4; this may not be an issue that the BLM can resolve through management.

Hells Bellows Allotment. Voluntary nonuse has been the primary action taken by the permittee, in coordination with the BLM, to improve riparian conditions on this allotment.

Lake Allotment. The modifications identified in the 2006 Rangeland Health{ XE "Rangeland Health" } Determination have been taken on this allotment; as anticipated, it has improved conditions. Complete nonuse from 2001 to 2006 and partial voluntary nonuse from 2007 to

2013 has resulted in the rest of or very light use of Fiftymile Mountain (physical location of the Lake allotment and summer pastures of the Rock Creek-Mudholes allotment). The BLM removed unauthorized feral cattle, resulting in less impact on riparian areas{ XE "Riparian Area" } and providing for rest and recovery from livestock impacts. Maintaining spring{ XE "Spring" } protection fences and pasture fences has improved riparian conditions.

Last Chance Allotment. The removal of feral cattle and voluntary nonuse are actions taken due to failed seedings{ XE "Seeding" }. These actions have reduced pressure on the riparian areas{ XE "Riparian Area" }. The reduced use has led to improved conditions of riparian areas, as anticipated. Maintaining the Relishen Spring{ XE "Spring" } protection fence has also improved riparian conditions. Because of these actions, such riparian areas as Last Chance Creek have exhibited increased vegetation recruitment, vigor, and continuity. This has made progress toward meeting Standard 2. Improved riparian conditions provide for water quality in line with the geologic and physiographic conditions on the allotment; livestock are no longer considered a causal factor{ XE "Causal Factor" } in not meeting Standard 4.

Lower Cattle Allotment. The grazing management modifications identified forage availability and the proper distribution and management of livestock (water distribution, development of an allotment management plan{ XE "Allotment Management Plan" }, and fencing) as concerns on the allotment. Voluntary nonuse addresses forage availability by adjusting annually the numbers of livestock using the allotment. The water-controlled, deferred rotation of livestock, maintenance of stock ponds, and use of supplements together improve livestock management. This comes about by reducing livestock concentrations, improving recovery periods for key forage species, and shortening grazing periods. As a result, PFC assessments in 2010 indicate the riparian areas{ XE "Riparian Area" } are now in PFC, and upland monitoring shows gains in species diversity.

Mollies Nipple Allotment. The actions taken by the BLM and the permittee have improved conditions for riparian areas{ XE "Riparian Area" }, soils, and vegetation in the allotment. The permittee's voluntary nonuse has addressed the loss of available forage, and actual use levels have not exceeded the authorized use. Use levels have been adjusted annually for drought conditions. The BLM has treated and restored the vegetation on more than 8,500 acres. The permittee is once again following the deferred rest rotation grazing system, providing for rest and recovery from grazing impacts and improved vegetative conditions. The BLM and permittee have maintained or constructed pipelines, spring{ XE "Spring" } developments, protection fences, and water catchments (stock ponds), thereby improving livestock distribution and lessening impacts. Riparian health has also improved as a result of these actions, with increased recovery periods and less overall use. PFC assessments and allotment monitoring have shown significant improvement on the allotment.

Nipple Bench Allotment. The primary reason for not achieving Standard 2 in the 2006 Rangeland Health{ XE "Rangeland Health" } Determination was that a county road was affecting Nipple Spring{ XE "Spring" }; livestock was not a causal factor{ XE "Causal Factor" }. The location of the spring and road in a narrow canyon bottom does not allow for practical options for relocating the road. Not meeting Standard 4 was due primarily to natural background geologic

and physiographic conditions, though livestock grazing may be a minor contributing factor{ XE "Contributing Factor" }.

Rock Creek-Mudholes Allotment. The modifications identified in the 2006 Rangeland Health{ XE "Rangeland Health" } Determination have been taken on this allotment; as anticipated, conditions have improved. Complete nonuse from 2001 to 2006 and partial voluntary nonuse from 2007 to 2013 have resulted in the rest of or very light use of Fiftymile Mountain, as recommended. The BLM has removed unauthorized feral cattle, resulting in less impact on riparian areas{ XE "Riparian Area" } and providing for rest and recovery from livestock impacts. Maintaining spring{ XE "Spring" } protection fences and pasture fences has improved riparian conditions, thereby minimizing the impact of livestock grazing on Standard 4. This also has addressed the concern that livestock use is a causal factor{ XE "Causal Factor" } in not meeting this standard. Natural (geologic and physiographic) conditions also affect whether this standard is met.

School Section Allotment. The BLM acquired this allotment, consisting of one state school section, about the time rangeland health{ XE "Rangeland Health" } assessments{ XE "Rangeland Health, Assessment" } were being conducted. GSENM issued a BLM grazing permit{ XE "Permit, Grazing" } shortly after acquisition and began managing the area. Following the 2006 Rangeland Health Determination, the BLM implemented four years of rest (100 percent voluntary nonuse from 2007 to 2010). Actual use before the BLM's acquisition is not known. Nonuse has reduced the impacts on upland vegetation and has increased diversity, vigor, and recruitment of desired species. Assessments completed in 2013 indicate improved conditions and significant progress toward meeting land health standards.

Soda Allotment. Yearlong use of this allotment by feral livestock had a major impact on the riparian areas{ XE "Riparian Area" }; this use was not identified in the 2006 Rangeland Health{ XE "Rangeland Health" } Determination for this allotment. Removing feral livestock and maintaining spring{ XE "Spring" } exclosures to exclude livestock from spring sources have addressed concerns regarding Standard 2. Maintaining and improving the water developments has improved livestock distribution and use supervision; adhering to the existing rotational grazing system has ensured that spring grazing does not occur after March 31 on consecutive years. These actions and the nonuse from 2001 to 2006, which was implemented immediately when the BLM recognized poor range conditions during assessment, have made significant progress toward meeting both Standards 1 and 2.

Swallow Park Allotment. In coordination with permittees, the BLM adjusted the timing of use of the Bulrush Pasture, which has allowed for spring{ XE "Spring" } growth and vegetation recruitment in the riparian corridor. Voluntary nonuse based on available forage and range condition has also reduced such impacts as bank shear, utilization{ XE "Utilization" }, and trampling. The BLM noted Improvement in assessments it conducted in 2010.

Upper Paria Allotment. Voluntary nonuse has resulted in fewer grazing impacts on upland areas, seedings{ XE "Seeding" }, and riparian vegetation. Maintaining riparian protection fences, pipelines, and stock ponds has protected riparian areas{ XE "Riparian Area" } and increased the distribution of cattle throughout the allotment. As a result, those areas with adequate water and less affected by the scouring of high water events and diversion for agriculture have improved

and are making significant progress toward meeting Standard 2. Voluntary nonuse has addressed the loss of forage resulting from seedings that are no longer productive. These seedings have crossed a threshold that, without restoration, will continue to not meet Standard 1, despite the substantial nonuse. Where seeding restoration has occurred, significant progress toward meeting standards has been made, and the BLM intends to conduct additional restoration treatment as funding becomes available. In the meantime, voluntary nonuse continues at levels consistent with forage production. Standard 4 was not being met, due primarily to natural background geologic and physiographic conditions and the influence of irrigation diversion dewatering outside the BLM's control.

Vermilion Allotment. The permittee has implemented voluntary nonuse and the rehabilitation of approximately 3,100 acres of seeding{ XE "Seeding" } and vegetation restoration work. The intent was to address the upland issues and make significant progress toward meeting Standards 1 and 3. Soil stability, vegetation recruitment, diversity, and desired species have increased. Installing and repairing spring{ XE "Spring" } protection fences and constructing water developments has aided livestock distribution throughout the allotment and decreased impacts on riparian areas{ XE "Riparian Area" }. Voluntary nonuse has also decreased the impacts from livestock grazing on the riparian areas. These actions have resulted in significant progress toward meeting Standard 2. The improved riparian conditions minimize the impact of livestock grazing on water quality (Standard 4) by filtering sediment, maintaining vegetation that stabilizes the riparian area, and shading the site, thereby reducing evaporation and maintaining water temperatures. Establishing exclosure fences eliminates trampling, compaction, and other impacts on water quality.

Forage{ XE "Forage" } Production

The rangeland suitability analyses conducted in the late 1970s in preparation of the Kanab-Escalante Grazing EIS identified lands suitable for livestock use. The BLM defined suitable rangeland as "forage-producing land which can be grazed on a sustained-yield basis under an attainable management system. Suitable rangeland can be grazed without causing damage to the basic soil resource of the specific or adjacent areas" (BLM 1980b, Appendix 9). Unsuitable rangelands were not given a carrying capacity, and no range improvements{ XE "Range Improvement" } or actions to attract livestock were taken on unsuitable rangelands (BLM 1980b, Appendix 9). Current range management is an adaptive process, where ongoing grazing is appraised through monitoring, then modified, then re-appraised. This process is often referred to as "stock and monitor."

The BLM is implementing the AIM{ XE "Assessment, Inventory, and Monitoring (AIM)" } strategy, which provides a framework for integrated, cross-program assessment, inventory, and monitoring of resources at multiple scales of management. In 2013, AIM surveys began as a pilot program on 2 of the 79 grazing allotments (Death Hollow and Last Chance). During July and August 2013, the BLM sampled 35 plots for assessment, including 21 plots in Death Hollow and 14 plots in Last Chance allotments. In 2014, the AIM sampling strategy was changed from an allotment-focused sampling to a sampling design that included the entire planning area. The change was intended to collect data to better inform land use managers, both in terms of refining forage production calculations and to supplement land health condition data. In 2014, data were collected from 50 plots, representing the full range of ecological site{ XE "Ecological

Site" } types in the planning area (Great Basin Institute 2014). As more data becomes available, the BLM will be able to better estimate total forage production.

3.1.2 Trends

The BLM forecasts that the demand for livestock forage and livestock permits will continue and will likely increase. Kane and Garfield Counties have indicated they would like to see improved land health and increased grazing levels. Local ranchers have stressed the importance of GSENM to their ranching operations and the importance of ranching to their families.

3.1.3 References

BLM (United States Department of the Interior, Bureau of Land Management). 1980a. Kanab/Escalante Grazing Management Final Environmental Impact Statement. Cedar City District, Utah.

______. 1980b. Kanab/Escalante Grazing Management Draft Environmental Impact Statement. Cedar City District, Utah.

______. 1981a. Paria Management Framework Plan. BLM, Kanab Resource Area, Cedar City District, Utah. April 22, 1981.

______. 1981b. Escalante Management Framework Plan. BLM, Escalante Resource Area, Cedar City District, Utah. April 22, 1981.

______. 1997. Standards for Rangeland Health{ XE "Rangeland Health" } and Guidelines for Grazing Management for BLM Lands in Utah. BLM, Utah State Office.

______. 1999. Escalante Management Framework Plan Approved Amendment and Decision Record. BLM Utah State Office, Salt Lake City. March 15, 1999.

______. 2001. Handbook H-4180-1, Rangeland Health{ XE "Rangeland Health" } Standards. BLM, Washington, DC. January 19, 2001.

______. 2006. Rangeland Health{ XE "Rangeland Health" } Determination. BLM, Grand Staircase-Escalante National Monument. Kanab, Utah.

______. 2008a. Kanab Field Office Record of Decision and Approved Resource Management Plan. BLM, Kanab Field Office, Kanab, Utah. October 2008.

______. 2008b. Arizona Strip Field Office Record of Decision and Resource Management Plan. BLM, Arizona Strip Field Office, St. George, Utah. February 2008.

______. Undated. Unpublished allotment summaries. Grand Staircase-Escalante National Monument, Kanab, Utah. Last updated 2014.

BLM GIS. 2014. Base GIS data on file with BLM's eGIS Server, used for calculations or figures to support the MMP{ XE "Monument Management Plan, Grand Staircase-Escalante National Monument (MMP 2000)" }-A. BLM, Grand Staircase Escalante National Monument, Utah.

Forest Service (United States Department of Agriculture, National Forest Service) and BLM (United States Department of the Interior, Bureau of Land Management). 1996. Interagency Technical Reference 1734-3, Utilization{ XE "Utilization" } Studies and Residual Measurements. Revised 1997, 1999.

Great Basin Institute. 2014. Land Health Assessment: BLM GSENM: 2014 Final Report. Great Basin Institute, Reno, Nevada.

Miller, M. E. 2008. "Broad-scale assessment of rangeland health{ XE "Rangeland Health" }, Grand Staircase-Escalante National Monument, USA." *Rangeland Ecology and Management* 61:249-262.

NPS (United States Department of the Interior, National Park Service). 1979. Glen Canyon National Recreation Area Proposed General Management Plan{ XE "General Management Plan, Glen Canyon (GMP 1979)" }, Wilderness Recommendation, and Road Study Alternatives Final Environmental Impact Statement.

______. 1999. Glen Canyon National Recreation Area Grazing Management Plan{ XE "Grazing Management Plan, Glen Canyon (GzMP 1999)" } and Finding of No Significant Impact. NPS, Glen Canyon National Recreation Area, Page, Arizona. August 1999.

______. 2006. Management Policies. United States Department of the Interior, National Park Service. ISBN 0-16-076874-8.

Pellant, M., P. Shaver, D. A. Pyke, and J. E. Herrick. 2005. Interpreting indicators of rangeland health{ XE "Rangeland Health" }, version 4. Technical Reference 1734-6. United States Department of the Interior, Bureau of Land Management, National Science and Technology Center, Denver, Colorado. BLM/WO/ST-00/001+1734/REV05.

Toeves, G. R., J. J. Taylor, C. S. Spurrier, W. C. MacKinnon, and M. R. Bobo. 2011. Bureau of Land Management Assessment, Inventory, and Monitoring{ XE "Assessment, Inventory, and Monitoring (AIM)" } Strategy for Integrated Renewable Resources Management. BLM, National Operations Center, Denver, Colorado.

3.2 Vegetation

The analysis area is within portions of two United States Environmental Protection Agency (EPA) level III ecoregions{ XE "Ecoregion" }: Colorado Plateau and Arizona/New Mexico Plateau (EPA 2011). The Colorado Plateau ecoregion is primarily in eastern Utah and western Colorado, with some overlap into northern Arizona and New Mexico. More than 99 percent of the planning area (2,313,700 acres) and more than 99 percent of the decision area (2,251,900 acres) are within the Colorado Plateau ecoregion. The Arizona/New Mexico Plateau ecoregion occurs in northern Arizona, northwestern New Mexico, and south-central Colorado. It overlaps with the very southern portion of the planning area and covers 2,500 acres (less than one percent) of the planning area and 1,700 acres (less than one percent) of the decision area.

The analysis area is also within the ecoregion{ XE "Ecoregion" } addressed in the Colorado Plateau Rapid Ecoregional Assessment (REA) Report (Bryce et al. 2012). The REA represents a

landscape approach to land and resource management in the ecoregion, framed by a set of regionally relevant management questions. While focused at the landscape scale, the REA provides models of existing and future conditions that may be useful where site-specific information is lacking. The REA integrates available scientific data and information from BLM field offices, other federal and state agencies, and public stakeholders to develop shared responses and collaborative management efforts across administrative boundaries. The REA also assesses the status of selected ecological resources (conservation elements) at the eco-regional scale. It investigates how this status may change in the future in response to four major disturbances or change agents: climate change, wildfire, invasive species{ XE "Invasive Species" }, and development. Resources of concern identified in the REA are the regionally significant ecosystems: biotic (plants and animals) and abiotic elements (such as soil and water resources) and related ecosystem functions and services (such as soil stability, wind erodibility and dust on snow, biological soil crusts{ XE "Biological Soil Crust" }, and aquatic resources; Bryce et al. 2012). Vegetation and weeds are discussed as relevant to the resources described above.

The BLM and NPS follow federal regulations related to vegetation management, including:

Federal Laws and Regulations

- Federal Noxious Weed Act (7 USC, Section 2801 et seq.)

BLM Policy

- Manual 1737, Riparian Wetland{ XE "Wetland" } Management (1992). This establishes the process for assessing PFC.
- BLM IM 2013-111. This provides for the use of a standardized, hierarchical, classification system (the National Vegetation Classification System, or NVCS) as a framework to identify desired outcomes for and to analyze vegetation resources in all RMPs and plan amendments. For planning purposes (as used in the BLM's Land Use Planning Handbook 1601-1), it defines vegetative type as the macrogroup level of the United States National Vegetation Classification.
- IM UT-2005-091, Attachment 1, Utah Riparian Management Policy. This states that riparian areas{ XE "Riparian Area" } will be maintained in or improved to PFC.
- Handbook H-1740-2, Integrated Vegetation Management H-1740-2 (2008). This guides implementation of vegetation management planning and treatment activities to achieve the objectives set forth in Manual 1740, Renewable Resource Improvements and Treatments (2008). These objectives include adding policy on maintaining and restoring native plant community diversity, resiliency, and productivity.

NPS Policy

- NPS Management Policies, Chapter 4, Natural Resource Management (NPS 2006).
- Director's Order 77-1, Wetland{ XE "Wetland" } Protection. The purpose of this Director's Order is to establish NPS policies, requirements, and standards for implementing Executive Order 11990, Protection of Wetlands. Section 2 describes these policies, requirements, and standards.

- Director's Order 77-7, Integrated Pest Management Manual. This provides descriptions of the biology and management of 21 species or categories of pests.

Miscellaneous

- Executive Order 11990, Protection of Wetlands{ XE "Wetland" } (May 24, 1977).
- Executive Order No. 13112: Invasive Species, 1999.
- DOI Manual 520, Chapter 1, Floodplain Management and Wetlands{ XE "Wetland" } Protection Procedures (2000). This sets forth the procedures to be followed in implementing Executive Order 11988, Floodplain Management (now Executive Order 13690 [signed October 2015]) and Executive Order 11990, Protection of Wetlands.

The proclamation establishing GSENM identified several objects related to vegetation. These include ecosystems in five life zones (low-lying desert to coniferous forest); hanging gardens, floristic communities in tinajas, rock crevices, and canyon bottoms; endemic plants and their pollinators, riparian corridors, and coniferous forests.

Vegetation is also one of the values and purposes of Glen Canyon. The Glen Canyon GzMP{ XE "Grazing Management Plan, Glen Canyon (GzMP 1999)" } includes the following value statement: "Vegetation provides the basis for wildlife habitat and produces the necessary forage for livestock. Healthy vegetation (with adequate cover and composition) inhibits soil erosion, maintains high water quality, regulates water quantity, and maintains the nutrient cycling essential for both plant and animal life. Native vegetation is of great scientific value and provides for scenic and aesthetic enjoyment by recreation area visitors (NPS 1999)."

Current management for vegetation is as described in **Chapter 2** and **Appendices A** and **B**.

Upland Vegetation

Upland vegetation includes those plant species not associated with rivers, creeks, lakes, springs{ XE "Spring" }, wetlands{ XE "Wetland" }, or other surface or shallow subsurface water. Upland vegetation comprises most of the vegetation within the planning area. Upland vegetation provides an enormous variety of functions in an ecosystem and also provides for a variety of human and animal uses. Upland vegetation stabilizes soils, prevents erosion, uses carbon dioxide, releases oxygen, reflects species diversity, and provides habitat and food for animals and resources for human use.

Ecosystems reflect complex sets of interactions between plants, animals, soil, water, air, temperature, topography, fire, and humans. Influences exerted on one component affect other components in the system. Upland vegetation provides many functions within ecosystems. Many of the BLM's land management policies are directed toward managing for healthy upland vegetative communities that support resistant or resilient ecological systems.

Riparian and Wetland{ XE "Wetland" } Vegetation

Riparian vegetation generally occurs next to rivers, creeks, lakes, springs{ XE "Spring" }, and wetlands{ XE "Wetland" }. Riparian areas{ XE "Riparian Area" } are a transition zone between

upland and aquatic ecosystems. Riparian areas occur where water is perennial{ XE "Perennial" } or intermittent. Riparian areas are defined as:

> [A] form of wetland{ XE "Wetland" } transition between permanently saturated wetlands and upland areas. These areas exhibit vegetation or physical characteristics reflective of permanent surface or subsurface water influence. Lands along, adjacent to, or contiguous with perennially and intermittent flowing rivers and streams, glacial potholes, and the shores of lakes and reservoirs with stable water levels are typical riparian areas{ XE "Riparian Area" } (Leonard et al. 1992, p. 7).

Wetlands{ XE "Wetland" } occur in spaces between terrestrial and aquatic systems where the water table is usually at or near the surface or where shallow water covers the land (Cowardin et al. 1979). Soil, water conditions, and vegetation type distinguish wetlands from all other ecosystems. The United States Army Corps of Engineers regulates wetlands, which are defined as "those areas inundated or saturated by surface or ground water at a frequency and duration sufficient to support, and that under normal circumstances do support, a prevalence of vegetation typically adapted for life in saturated soil conditions. Wetlands generally include swamps, marshes, bogs, and similar areas" (United States Army Corps of Engineers 1987, p. 9).

Wetlands{ XE "Wetland" } must have one or more of the following three attributes:

- At least periodically, the land supports predominantly hydrophytes (plants that grow only in water or very moist soil).
- The substrate is predominantly undrained hydric soil (soil formed under conditions of saturation, flooding, or ponding).
- The substrate is not solid, is saturated with water, or is covered by shallow water at some time during the growing season of each year.

Both riparian areas{ XE "Riparian Area" } and wetlands{ XE "Wetland" } are composed of unique vegetation and soil types that developed under the influence of perennial{ XE "Perennial" } water. The increased moisture found in these areas produces unique plant communities that differ noticeably from the surrounding upland vegetation.

Noxious Weeds and Nonnative Invasive Plants

In general, weeds disrupt or have the potential to disrupt or alter the natural ecosystem function, composition, or diversity of the site they occupy. These species can complicate the use of local natural resources and may interfere with management objectives for the site.

Nonnative, invasive plants{ XE "Invasive Species" } have the potential to become a dominant or co-dominant species on the site if their future establishment and growth is not controlled by management interventions. Invasive plants also include noxious weeds{ XE "Noxious Weed" }. Species that become dominant for only one to several years (e.g., short-term response to drought or wildfire) are not invasive plants (BLM Handbook H-1740-2, Integrated Vegetation Management). Invasive plants are widespread and can damage crops, affect entire industries, adversely affect natural ecosystem functions, and harm the environment and public health.

Organisms that have been moved from their native habitat to a new location, especially from a different country, are typically referred to as nonnative.

Noxious weeds{ XE "Noxious Weed" } are plant species designated by a federal or state law as generally possessing one or more of the following characteristics: aggressive and difficult to manage; parasitic; a carrier or host of serious insects or disease; or nonnative, new, or not common in the United States (BLM Handbook H-1740-2, Integrated Vegetation Management). Noxious weeds in the planning area are native or nonnative plants as designated by the Utah Noxious Weed Act of 2008. Although noxious weeds are usually nonnative, this document makes a distinction because native plants can be considered invasive.

3.2.1 Current Conditions

Upland Vegetation

As discussed, the planning area is in portions of two EPA level III ecoregions{ XE "Ecoregion" }: Colorado Plateau and Arizona/New Mexico Plateau (EPA 2011). The Colorado Plateau ecoregion is characterized by pinyon-juniper and Gambel oak woodlands, as well as saltbrush-greasewood shrublands. Summer moisture from thunderstorms supports warm season grasses. Many endemic plants occur (EPA 2013, p. 5). The Arizona/New Mexico Plateau ecoregion is a large transitional region between other ecoregions. These ecoregions contain semiarid grasslands to the east, shrublands and woodlands to the north, and Mojave and Chihuahuan Deserts to the west and south (EPA 2013, p. 5).

The planning area supports a diversity of existing and potential upland vegetation types. Vegetation types are controlled in large part by site-specific topography, soil type, and climatic conditions. Existing vegetation types in the planning area are described using the NVCS. The NVCS identifies 14 major existing vegetation types (macrogroups) in the planning area (**Table 3-5**; **Figure 3-2**~~**Figure 3-2**~~, Existing Vegetation Types~~Existing Vegetation Types~~). The BLM NVCS macrogroups with analogous LANDFIRE ecological systems (**Table 3-5**). These ecological systems encompass seven of the eight upland vegetation types identified as Colorado Plateau REA conservation elements that represent the regional range in elevation and aridity within the ecoregion{ XE "Ecoregion" } (Bryce et al. 2012).

Figure 3-2 Existing Vegetation Types

1

Table 3-5
Existing Vegetation Types

NVCS Macrogroup	NVCS MG Code	LANDFIRE Ecological System	Existing Vegetation Type		Biophysical Setting[1]	
			Acres in Planning Area	Acres in Decision Area	Acres in Planning Area	Acres in Decision Area
Rocky Mountain Two-Needle Pinyon-Juniper Woodland, M027			**687,600 (30%)**	**665,800 (30%)**	**610,900 (26%)**	**607,500 (27%)**
Rocky Mountain Two-Needle Pinyon-Juniper Woodland	M027	Colorado Plateau Pinyon-Juniper Woodland	687,600	665,800	599,900	597,100
Rocky Mountain Two-Needle Pinyon-Juniper Woodland	M027	Colorado Plateau Pinyon-Juniper Shrubland	0	0	11,000	10,400
Great Basin and Intermountain Dry Shrubland and Grassland, M171			**649,700 (28%)**	**637,600 (28%)**	**237,600 (10%)**	**232,800 (10%)**
Great Basin and Intermountain Dry Shrubland and Grassland	M171	Colorado Plateau Blackbrush-Mormon-tea Shrubland	4,200	4,200	154,200	153,600
Great Basin and Intermountain Dry Shrubland and Grassland	M171	Southern Colorado Plateau Sand Shrubland	115,500	111,800	46,600	44,900
Great Basin and Intermountain Dry Shrubland and Grassland	M171	Inter-Mountain Basins Semi-Desert Shrub-Steppe	80,800	77,600	22,000	20,500
Great Basin and Intermountain Dry Shrubland and Grassland	M171	Inter-Mountain Basins Semi-Desert Grassland	81,500	79,900	14,800	13,800
Great Basin and Intermountain Dry Shrubland and Grassland	M171	*Coleogyne ramosissima* Shrubland Alliance	367,700	364,100	0	0
Barren	**M329**	**Barren**	**363,600 (16%)**	**358,900 (16%)**	**363,600 (16%)**	**362,200 (16%)**
Great Basin and Intermountain Tall Sagebrush Shrubland and Steppe, M169			**182,100 (8%)**	**171,600 (8%)**	**405,900 (18%)**	**377,200 (17%)**
Great Basin and Intermountain Tall Sagebrush Shrubland and Steppe	M169	Inter-Mountain Basins Big Sagebrush Shrubland	181,600	171,100	320,000	297,200

Table 3-5
Existing Vegetation Types

NVCS Macrogroup	NVCS MG Code	LANDFIRE Ecological System	Existing Vegetation Type		Biophysical Setting[1]	
			Acres in Planning Area	Acres in Decision Area	Acres in Planning Area	Acres in Decision Area
Great Basin and Intermountain Tall Sagebrush Shrubland and Steppe	M169	Inter-Mountain Basins Montane Sagebrush Steppe	520	510	85,900	80,000
Great Basin Saltbrush Scrub, M093			**154,500 (7%)**	**145,400 (6%)**	**358,300 (15%)**	**344,800 (15%)**
Great Basin Saltbrush Scrub	M093	Inter-Mountain Basins Mat Saltbush Shrubland	16,800	16,300	16,900	16,400
Great Basin Saltbrush Scrub	M093	Inter-Mountain Basins Mixed Salt Desert Scrub	137,700	129,100	341,400	328,400
Intermountain Basin Cliff, Scree, and Rock Vegetation	M118	Intermountain Basins Sparsely Vegetated Systems	**137,700 (6%)**	**134,400 (6%)**	**68,300 (3%)**	**61,600 (3%)**
Introduced and Semi Natural Vegetation, M332			**56,900 (2%)**	**55,900 (2%)**	**0 (0%)**	**0 (0%)**
Introduced and Semi Natural Vegetation	M332	Introduced Upland Vegetation-Annual Grassland	15,000	14,700	0	0
Introduced and Semi Natural Vegetation	M332	Introduced Riparian Shrubland	41,900	41,200	0	0
Rocky Mountain and Great Basin Flooded and Swamp Forest, M034			**31,300 (1%)**	**30,300 (1%)**	**118,400 (5%)**	**111,900 (5%)**
Rocky Mountain and Great Basin Flooded and Swamp Forest	M034	Rocky Mountain Montane Riparian Systems	23,900	23,000	118,400	111,900
Rocky Mountain and Great Basin Flooded and Swamp Forest	M034	Rocky Mountain Wetland-{ XE "Wetland" }Herbaceous	7,400	7,300	0	0
Cool Semi-Desert Alkali-Saline Wetland,{ XE "Wetland" **} M082**			**9,400 (<1%)**	**8,400 (<1%)**	**4,300 (<1%)**	**3,900 (<1%)**
Cool Semi-Desert Alkali-Saline Wetland{	M082	Inter-Mountain Basins Greasewood Flat	9,400	8,400	4,300	3,900

Table 3-5
Existing Vegetation Types

NVCS Macrogroup	NVCS MG Code	LANDFIRE Ecological System	Existing Vegetation Type		Biophysical Setting[1]	
			Acres in Planning Area	Acres in Decision Area	Acres in Planning Area	Acres in Decision Area
XE "Wetland" }						
Rocky Mountain Alpine Cliff, Scree, and Rock Vegetation	M119	Rocky Mountain Alpine/Montane Sparsely Vegetated Systems	5,600 (<1%)	5,300 (<1%)	60 (<1%)	50 (<1%)
Great Basin and Intermountain Dwarf Sagebrush Shrubland and Steppe, M170			**5,100 (<1%)**	**4,700 (<1%)**	**30,500 (1%)**	**30,000 (1%)**
Great Basin and Intermountain Dwarf Sagebrush Shrubland and Steppe	M170	Colorado Plateau Mixed Low Sagebrush Shrubland	5,100	4,700	30,500	30,000
Southern Rocky Mountain Lower Montane Forest, M022			**3,300 (<1%)**	**2,300 (<1%)**	**43,500 (2%)**	**39,500 (2%)**
Southern Rocky Mountain Lower Montane Forest	M022	Southern Rocky Mountain Ponderosa Pine Woodland	3,300	2,300	43,500	39,500
Southern Rocky Mountain Montane Grassland and Shrubland, M049			**3,100 (<1%)**	**2,600 (<1%)**	**31,800 (1%)**	**30,100 (1%)**
Southern Rocky Mountain Montane Grassland and Shrubland	M049	Rocky Mountain Gambel Oak-Mixed Montane Shrubland	1,400	1,100	16,500	15,300
Southern Rocky Mountain Montane Grassland and Shrubland	M049	Rocky Mountain Lower Montane-Foothill Shrubland	1,700	1,500	15,300	14,800
Intermountain Singleleaf Pinyon – Western Juniper Woodland, M026			**2,200 (<1%)**	**2,200 (<1%)**	**17,200 (<1%)**	**17,000 (<1%)**
Intermountain Singleleaf Pinyon Western Juniper Woodland	M026	Inter-Mountain Basins Juniper Savanna	2,200	2,200	17,200	17,000
Developed and Urban	**M336**	**Developed and Urban**	**11,600 (<1%)**	**6,500 (<1%)**	**0 (0%)**	**0 (0%)**

Table 3-5
Existing Vegetation Types

NVCS Macrogroup	NVCS MG Code	LANDFIRE Ecological System	Existing Vegetation Type		Biophysical Setting[1]	
			Acres in Planning Area	Acres in Decision Area	Acres in Planning Area	Acres in Decision Area
Other Vegetation Types[2]	**N/A**		**19,300 (<1%)**	**10,100 (<1%)**	**11,000 (<1%)**	**22,500 (1%)**
TOTAL			**2,316,200**	**2,241,000**	**2,316,200**	**2,241,000**

Sources: NVCS 2015; LANDFIRE GIS 2015; BLM GIS 2014

[1]More information about each biophysical setting can be found at http://www.landfire.gov/NationalProductDescriptions24.php.
[2]Represents ecological systems that cover less than 2,000 acres within the decision area.

The NVCS macrogroups do not specifically identify riparian systems. Twelve of the vegetation types listed in **Table 3-5** are upland vegetation types. Riparian and wetland{ XE "Wetland" } systems are encompassed by the Cool Semi-Desert Alkali-Saline Wetland (M082) and Rocky Mountain and Great Basin Flooded and Swamp Forest (M034) NVCS macrogroups. Riparian and wetland vegetation is discussed in the following section.

Table 3-5 presents acres of existing vegetation types within the planning and decision areas; these represent the plant community (species composition) currently present at a given site. While the NVCS was intended to crosswalk to existing vegetation, the table also presents acres of each equivalent LANDFIRE biophysical setting in the planning and decision areas for comparison. Biophysical settings are models that represent the vegetation that may have been dominant on the landscape prior to Euro-American settlement. These are based on both the current biophysical environment and an approximation of the historical disturbance regime. The LANDFIRE biophysical setting models describe vegetation, geography, biophysical characteristics, succession stages, and disturbance regimes for each biophysical setting and some of the major disturbance types affecting these ecosystems prior to significant alterations by European settlers (NIFTT 2009).

LANDFIRE biophysical setting models provide land managers with a historical (pre-European settlement) perspective of landscape conditions. The biophysical setting models serve as a potential baseline from which to compare historical to current conditions and assess departure from historical conditions (sometimes referred to as the natural range of variability). Though LANDFIRE biophysical setting models are projections of historical vegetation, information provided by these models may be used to help land managers determine the mix of vegetation types that may comprise desired future conditions (NIFTT 2009).

Each biophysical setting model has a number of succession classes (**Table 3-6**, Biophysical Settings and Succession Classes; Figure 3-3~~Figure 3-3~~, Biophysical Setting). The description of each biophysical setting model includes the estimated mean percent of the biophysical setting

Table 3-6
Biophysical Settings and Succession Classes

Biophysical Setting[1]	Succession Classes	Cover Historic/Current
Colorado Plateau Pinyon-Juniper Woodland		
	Class A: Early Development 1 All Structures[2]	10/32%
	Class B: Mid Development 1 Closed[2]	20/1%
	Class C: Mid Development 1 Open[2]	25/34%
	Class D: Late Development 1 Open	35/29%
	Class E: Late Development 1 Closed	10/1%
Colorado Plateau Pinyon-Juniper Shrubland		
	Class A: Early Development 1 Open	5/33%
	Class B: Mid Development 1 Open	5/2%
	Class C: Mid Development 2 Open	10/40%
	Class D: Late Development 1 Open	35/9%
	Class E: Late Development 2 Open	45/0%
Colorado Plateau Blackbrush-Mormon-tea Shrubland		
	Class A: Early Development 1 All Structures	5/3%
	Class B: Late Development 2 Closed	30/88%
	Class C: Late Development 1 Open	65/5%
Southern Colorado Plateau Sand Shrubland		
	Class A: Early Development 1 All Structures	20/18%
	Class B: Mid Development 1 Open	79/41%
	Class C: Mid Development 1 Closed	1/8%
Inter-Mountain Basins Semi-Desert Shrub-Steppe		
	Class A: Early Development 1 All Structures	10/4%
	Class B: Mid Development 1 Open	50/44%
	Class C: Late Development 1 Open	40/44%
Inter-Mountain Basins Semi-Desert Grassland		
	Class A: Early Development 1 Open	5/52%
	Class B: Mid Development 1 Open	73/2%
	Class C: Late Development 1 Open	20/6%
	Class D: Mid Development 2 Closed	2/1%
Inter-Mountain Basins Big Sagebrush Shrubland		
	Class A: Early Development 1 All Structures	15/4%
	Class B: Mid Development 1 Open	50/42%
	Class C: Mid Development 1 Closed	25/13%
	Class D: Late Development 1 Open	5/13%
	Class E: Late Development 1 Closed	5/24%
Inter-Mountain Basins Montane Sagebrush Steppe – Mountain Big Sagebrush		
	Class A: Early Development 1 Open	20/2%
	Class B: Mid Development 1 Open	50/17%
	Class C: Late Development 1 Closed	15/16%
	Class D: Late Development 1 Open	10/44%
	Class E: Late Development 2 Closed	5/16%

Table 3-6
Biophysical Settings and Succession Classes

Biophysical Setting[1]	Succession Classes	Cover Historic/Current
Inter-Mountain Basins Mat Saltbush Shrubland		
	Class A: Early Development 1 All Structures	10/25%
	Class B: Late Development 1 All Structures	90/65%
Inter-Mountain Basins Mixed Salt Desert Scrub		
	Class A: Early Development 1 All Structures	25/5%
	Class B: Mid Development 1 Open	45/26%
	Class C: Mid Development 2 Open	30/56%
Rocky Mountain Montane Riparian Systems		
	Class A: Early Development 1 All Structures	65/16%
	Class B: Mid Development 1 Closed	35/25%
Inter-Mountain Basins Greasewood Flat		
	Class A: Early Development 1 All Structures	5/14%
	Class B: Mid Development 1 Open	30/77%
	Class C: Late Development 1 Open	65/4%
Colorado Plateau Mixed Low Sagebrush Shrubland		
	Class A: Early Development 1 All Structures	10/2%
	Class B: Late Development 1 Open	70/23%
	Class C: Late Development 1 Closed	20/49%
Southern Rocky Mountain Ponderosa Pine Woodland		
	Class A: Early Development 1 All Structures	15/10%
	Class B: Mid Development 1 Closed	9/8%
	Class C: Mid Development 1 Open	20/74%
	Class D: Late Development 1 Open	55/5%
	Class E: Late Development 1 Closed	1/2%
Rocky Mountain Gambel Oak-Mixed Montane Shrubland –Continuous		
	Class A: Early Development 1 All Structures	10/9%
	Class B: Mid Development 1 All Structures	35/2%
	Class C: Late Development 1 All Structures	55/1%
Rocky Mountain Lower Montane-Foothill Shrubland		
	Class A: Early Development 1 All Structures	5/6%
	Class B: Mid Development 1 Closed	20/7%
	Class C: Late Development 1 Closed	65/3%
	Class D: Late Development 1 Open	10/21%
Inter-Mountain Basins Juniper Savanna		
	Class A: Early Development 1 Open	5/62%
	Class B: Mid Development 1 Open	5/8%
	Class C: Mid Development 2 Open	15/24%
	Class D: Late Development 1 Open	35/3%
	Class E: Late Development 2 Open	40/0%

Source: LANDFIRE 2007
[1]Includes ecological systems that cover more than 2,000 acres within the decision area.
[2]All structures can be comprised of open or closed canopy cover.

Figure 3-3 Biophysical Setting

occupied on the landscape by each succession class historically. These percentages were determined through quantitative modeling, which describes the rates and pathways of succession and the frequency and effects of various types of disturbances (NIFTT 2009). The complete biophysical setting descriptions are available at http://www.landfire.gov/national_veg_models_op2.php.

Within the last 50 years in the ecoregion{ XE "Ecoregion" }, the large blocks of intact vegetation that characterized the Colorado Plateau have been fragmented or otherwise impacted by nonnative plants, minerals development, including oil and gas leasing and uranium mining, recreation, livestock grazing, rural home development, road building, and expanding off-road vehicle usage (Bryce et al. 2012, p. 45).

Riparian and Wetland{ XE "Wetland" } Vegetation

Many riparian ecosystems have been lost or degraded since Euro-American contact. Causes of this decline include direct conversion to other uses, changes in the natural flow regimes and suppression of fluvial processes, livestock grazing, and invasive species{ XE "Invasive Species" } (Bryce et al. 2012). The mechanism by which this degradation occurs varies, depending on the threat. For example, livestock grazing has the potential to alter streamside morphology, increase sedimentation, degrade riparian vegetation through trampling and consumption, and cause nutrient loading to the system. In contrast, invasive plant species, such as tamarisk (*Tamarix* spp.) or Russian olive (*Elaeagnus angustifolia*), change riparian areas{ XE "Riparian Area" } by successfully outcompeting native riparian species. Species such as tamarisk produce seeds multiple times in a year and are more tolerant of drought and flow alterations than native species (Bryce et al. 2012). In addition, Russian olive has been shown to alter stream hydrology and nutrient cycling and to substantially lower habitat quality for migratory bird species (Zouhar 2005).

In addition, while the BLM considers tamarisk a significant change agent in the ecoregion{ XE "Ecoregion" }, the species has been declining. This is due to the tamarisk leaf beetle (*Diorhabda carinulata*), which the United States Department of Agriculture, Agricultural Research Service in Lovelock, Nevada, released in 2001 as a bio-control agent for tamarisk. The beetle's range quickly expanded, and there are a number of sites in Utah where it has been released since 2004. Since then, the beetle has spread and has destroyed tamarisk in some parts of the planning area. Studies have shown that defoliation can destroy tamarisk in three to five years (Clements et al. 2012), but this may vary.

The BLM has conducted PFC assessments on 192 lotic{ XE "Lotic" }[7] sites and 142 lentic{ XE "Lentic" }[8] sites in the planning area. This was part of the GSENM-wide rangeland health{ XE "Rangeland Health" } evaluations between 2000 and 2013 (**Table 3-7**, PFC Assessment Results for Lentic{ XE "Lentic" } Sites~~PFC Assessment Results for Lentic{ XE "Lentic" } Sites~~, and **Table** Sites~~PFC Assessment Results for Lotic{ XE "Lotic" } Sites~~). When the BLM issued the 2006 to meet Standard 2 if they were rated functioning-at-risk (FAR) with upward trend or PFC. Sites with other ratings were not considered to meet Standard 2. Since the 2006 rangeland health

[7] Flowing water habitat such as rivers or streams.
[8] Standing water habitat such as lakes, ponds, seeps, bogs, and meadows.

determinations, additional assessments have been conducted and assessment results have been updated.

As shown in **Table 3-7**, PFC Assessment Results for Lentic{ XE "Lentic" } Sites~~PFC Assessment~~ (48 percent of all sites assessed) were in PFC as of the latest assessment. In addition, 23 sites (16 percent) were FAR with an upward trend, while 44 sites (31 percent) were FAR with either no apparent trend or a downward trend, and 7 sites (5 percent) were nonfunctional. As presented in **Table 3-8**, PFC Assessment Results for Lotic{ XE "Lotic" } Sites~~PFC Assessment~~ percent of all sites assessed) were in PFC as of the latest assessment. In addition, 32 sites (17 percent) were FAR with an upward trend, while 47 sites (24 percent) were FAR with either no apparent trend or a downward trend, and 20 sites (10 percent) were nonfunctional.

Table 3-7
PFC Assessment Results for Lentic{ XE "Lentic" } Sites

ID	Riparian/Wetland { XE "Wetland" } Area	Year Assessed	Rating	Trend
Alvey Wash				
LE1501	Rock Springs{ XE "Spring" }	2002	FAR	UPWARD
LE1502	Mossy Dell Spring{ XE "Spring" }	2002	FAR	DOWNWARD
LE1512	Oak Springs{ XE "Spring" }	2002	PFC	No trend recorded
Big Bowns Bench				
LE0052*	Cliff Spring{ XE "Spring" }	2002	FAR	NOT APPARENT
Calf Pasture				
LE1207	Adams Spring{ XE "Spring" }	2002	PFC	No trend recorded
		2012	PFC	No trend recorded
LE1208	Corral Draw Spring{ XE "Spring" }	2002	FAR	NOT APPARENT
		2012	FAR	No trend recorded
Clark Bench				
LE0014	Whitehouse Spring{ XE "Spring" }	2001	PFC	No trend recorded
LE0015	Calf Spring{ XE "Spring" }	2001	FAR	UPWARD
LE0560	Calf Spring{ XE "Spring" }	2003	FAR	NOT APPARENT
Cockscomb				
LE1503	Cockscomb Spring{ XE "Spring" }	2002	PFC	No trend recorded
Cottonwood				

Table 3-7
PFC Assessment Results for Lentic{ XE "Lentic" } Sites

ID	Riparian/Wetland { XE "Wetland" } Area	Year Assessed	Rating	Trend
LE0017	Lake Cove Spring{ XE "Spring" }	2001	NF	No trend recorded
		2007	NF	No trend recorded
LE0018	Round Valley Seep	2001	NF	No trend recorded
		2007	PFC	No trend recorded
LE0050	Lower Coyote Spring{ XE "Spring" }	2001	NF	No trend recorded
		2007	PFC	No trend recorded
LE0500	Pump Canyon	2014	FAR	UPWARD
LE0501	Gratuitous Spring{ XE "Spring" }	2001	FAR	DOWNWARD
		2007	FAR	NOT APPARENT
		2014	PFC	No trend recorded
LE0502	Pump House Spring{ XE "Spring" }	2001	PFC	No trend recorded
LE0503	Unnamed Spring{ XE "Spring" }	2001	PFC	No trend recorded
Death Hollow				
LE0518	Unnamed	2002	FAR	DOWNWARD
LE0519	Unnamed	2002	FAR	DOWNWARD
Deer Creek				
LE0556	Natural Tank		PFC	No trend recorded
LE0557	Sandstone Tank 1	2002	PFC	No trend recorded
LE0558	Sandstone Tank 2	2002	PFC	No trend recorded
LE0559	Sandstone Tank 3	2002	PFC	No trend recorded
Escalante River				
LE0053*	Emigrant Spring{ XE "Spring" }	2002	PFC	No trend recorded
First Point				
LE1206	First Point Spring{ XE "Spring" }	2002	FAR	DOWNWARD
		2007	FAR	UPWARD

Table 3-7
PFC Assessment Results for Lentic{ XE "Lentic" } Sites

ID	Riparian/Wetland { XE "Wetland" } Area	Year Assessed	Rating	Trend
LE1710	Unnamed below Old Corral Spring{ XE "Spring" }	2007	FAR	NOT APPARENT
Flood Canyon				
LE0552	Glasseye Spring{ XE "Spring" }	2002	PFC	No trend recorded
LE1203	Glass Eye Canyon	2002	PFC	No trend recorded
Ford Well				
LE1518	Ford Well Spring{ XE "Spring" }	2002	FAR	DOWNWARD
Fortymile Ridge				
LE0536	Upper Hurricane I	2002	FAR	NOT APPARENT
		2007	PFC	No trend recorded
LE0537	Upper Hurricane II	2002	FAR	DOWNWARD
		2010	PFC	No trend recorded
		2014	PFC	No trend recorded
		2007	FAR	NOT APPARENT
LE0538	Upper Hurricane III	2002	NF	No trend recorded
		2010	PFC	UPWARD
LE0540	Wilcox Spring{ XE "Spring" }	2002	NF	No trend recorded
		2007	FAR	NOT APPARENT
LE1716	Willow Tank	2007	FAR	NOT APPARENT
Haymaker Bench				
LE1253	Beauty Spot	2003	PFC	No trend recorded
Headwaters				
LE0019	Fourmile Water	2001	PFC	No trend recorded
LE0051	Cane Bench Well	2002	PFC	No trend recorded
LE1000	Headquarters Spring{ XE "Spring" }	2009	FAR	DOWNWARD
LE1001	Headquarters Spring{ XE "Spring" } 2	2001	FAR	DOWNWARD

Table 3-7
PFC Assessment Results for Lentic{ XE "Lentic" } Sites

ID	Riparian/Wetland { XE "Wetland" } Area	Year Assessed	Rating	Trend
LE1002	Headquarters Spring{ XE "Spring" } 1	2001	FAR	DOWNWARD
Johnson Lakes				
LE0553	Neaf Spring{ XE "Spring" }	2002	FAR	DOWNWARD
King Bench				
LE1210	Unnamed Spring{ XE "Spring" }	2002	PFC	No trend recorded
Lake				
LE0043	Lake	2002	PFC	No trend recorded
LE0044	Cougar Spring{ XE "Spring" }	2002	PFC	No trend recorded
LE0045	Quakie Spring{ XE "Spring" }	2002	PFC	No trend recorded
LE0046	Georgie Hollow Spring{ XE "Spring" }	2002	FAR	UPWARD
LE0900	Harry Cowles Spring{ XE "Spring" }	2002	FAR	DOWNWARD
LE0901	Trib. Spencer	2002	FAR	NOT APPARENT
LE1504*	Wire Spring{ XE "Spring" }	2002	FAR	DOWNWARD
		2007	FAR	UPWARD
LE1505*	East End Spring{ XE "Spring" }	2002	FAR	DOWNWARD
		2007	FAR	UPWARD
LE1506*	Unnamed Cliff Spring{ XE "Spring" }	2002	FAR	DOWNWARD
		2007	PFC	No trend recorded
LE1507	Maple Spring{ XE "Spring" }	2002	NF	No trend recorded
		2007	FAR	NOT APPARENT
LE1508	Trail Hollow Seep	2002	FAR	DOWNWARD
		2007	FAR	NOT APPARENT
LE1509*	Bull Ridge Cliff Spring{ XE "Spring" }	2002	FAR	DOWNWARD
LE1510	Burn Spring{ XE "Spring" }	2002	FAR	DOWNWARD

Table 3-7
PFC Assessment Results for Lentic{ XE "Lentic" } Sites

ID	Riparian/Wetland { XE "Wetland" } Area	Year Assessed	Rating	Trend
		2007	FAR	UPWARD
LE1711	Tang Spring{ XE "Spring" }	2007	PFC	No trend recorded
Last Chance				
LE0031	Circle Spring{ XE "Spring" }	2002	FAR	NOT APPARENT
LE0032	Wild Rose Spring{ XE "Spring" }	2002	FAR	UPWARD
LE0033	Horse Spring{ XE "Spring" }	2002	PFC	No trend recorded
LE0034	Lower Trail Spring{ XE "Spring" }	2002	PFC	No trend recorded
LE0550	Upper Reese Seep	2002	FAR	DOWNWARD
		2010	PFC	No trend recorded
LE0551	Cat Spring{ XE "Spring" }	2002	FAR	DOWNWARD
		2010	PFC	No trend recorded
LE0905	Releshen Seep	2002	NF	No trend recorded
LE0905	Releshen Seep	2010	FAR	No trend recorded
LE1516	Unnamed Seep	2002	PFC	No trend recorded
Lower Cattle				
LE0041	25 Mile Corral Spring{ XE "Spring" }	2002	PFC	No trend recorded
LE0545	Little Red Rock Spring{ XE "Spring" }	2002	FAR	DOWNWARD
		2002	FAR	DOWNWARD
		2010	PFC	NOT APPARENT
		2014	PFC	No trend recorded
LE0546	Little Red Rock Sp. II	2002	FAR	DOWNWARD
		2010	PFC	NOT APPARENT
		2014	PFC	No trend recorded
Lower Hackberry				

Table 3-7
PFC Assessment Results for Lentic{ XE "Lentic" } Sites

ID	Riparian/Wetland { XE "Wetland" } Area	Year Assessed	Rating	Trend
LE1003	Spring{ XE "Spring" } below rockfall on Hackberry	2001	FAR	NOT APPARENT
Lower Warm Creek				
LE0027*	Warm Creek Spring{ XE "Spring" }	2002	PFC	No trend recorded
Mollies Nipple				
LE0007	Jenny Clay Hole Spring{ XE "Spring" }	2000	FAR	DOWNWARD
		2010	NF	No trend recorded
		2013	FAR	UPWARD
LE0008	Wildcat Spring{ XE "Spring" }	2001	FAR	DOWNWARD
		2013	PFC	No trend recorded
LE0009	Box Elder Canyon Spring{ XE "Spring" }	2001	NF	No trend recorded
		2010	FAR	UPWARD
		2014	FAR	UPWARD
LE0010	Kitchen Corral Spring{ XE "Spring" }	2001	FAR	DOWNWARD
		2007	PFC	No trend recorded
LE0011	Unnamed Spr. N of Kitchen Corral Spring{ XE "Spring" }	2001	NF	No trend recorded
		2007	FAR	NOT APPARENT
LE0012	Rockhouse Spring{ XE "Spring" }	2001	FAR	DOWNWARD
		2007	PFC	No trend recorded
LE0013	NE Spring{ XE "Spring" }	2001	NF	No trend recorded
		2010	FAR	NOT APPARENT
LE2000	Buckskin Gulch Spring{ XE "Spring" }	2004	FAR	DOWNWARD
		2010	FAR	NOT APPARENT

Table 3-7
PFC Assessment Results for Lentic{ XE "Lentic" } Sites

ID	Riparian/Wetland { XE "Wetland" } Area	Year Assessed	Rating	Trend
Moody				
LE0516*	Unnamed	2002	NF	DOWNWARD
LE1250*	Unnamed West Moody	2003	PFC	No trend recorded
LE1251*	Middle Moody Spring{ XE "Spring" }	2003	PFC	No trend recorded
LE1702*	Cane Seep	2002	PFC	No trend recorded
Nipple Bench				
LE0510	Tibbet Spring{ XE "Spring" }	2001	FAR	DOWNWARD
		2007	FAR	UPWARD
LE0511	Unnamed Spring{ XE "Spring" }	2001	FAR	DOWNWARD
		2007	FAR	UPWARD
LE0512	Unnamed Spring{ XE "Spring" }	2001	FAR	NOT APPARENT
Pine Creek				
LE0522	Unnamed	2002	FAR	DOWNWARD
Rock Creek-Mudholes				
LE0047	Llewlyn Spring{ XE "Spring" }	2002	FAR	NOT APPARENT
		2004	FAR	DOWNWARD
		2007	FAR	UPWARD
LE0048	Mudholes Spring{ XE "Spring" }	2002	FAR	DOWNWARD
		2004	FAR	DOWNWARD
		2007	FAR	UPWARD
LE0049	Pocket Hollow Spring{ XE "Spring" }	2002	NF	No trend recorded
		2002	FAR	DOWNWARD
		2004	FAR	DOWNWARD
LE0604	West End Spring{ XE "Spring" }	2002	FAR	DOWNWARD
LE0605	West End Spring{ XE "Spring" }	2002	NF	No trend recorded
LE0903	Gates Spring{ XE "Spring" }	2002	NF	No trend recorded
		2004	NF	No trend recorded

Table 3-7
PFC Assessment Results for Lentic{ XE "Lentic" } Sites

ID	Riparian/Wetland { XE "Wetland" } Area	Year Assessed	Rating	Trend
LE0906	Pocket Hollow Spring{ XE "Spring" }	2002	NF	No trend recorded
LE1204	Salt Spring{ XE "Spring" }	2002	NF	No trend recorded
		2007	FAR	UPWARD
LE1511	Buck Ridge	2002	NF	No trend recorded
LE1701*	Grand Bench Spring{ XE "Spring" }	2002	NF	No trend recorded
LE1712	Unnamed on Buck Ridge	2007	FAR	NOT APPARENT
LE1713	Unnamed Buck Ridge no.2	2007	FAR	UPWARD
Rush Beds				
LE0504	Unnamed Spring{ XE "Spring" }	2001	FAR	NOT APPARENT
Second Point				
LE1205	Old Corral Spring{ XE "Spring" }	2002	FAR	DOWNWARD
		2007	FAR	NOT APPARENT
LE1254	Cottonwood Spring{ XE "Spring" }	2003	PFC	No trend recorded
Soda				
LE0529	Fortymile Spring{ XE "Spring" }	2002	FAR	DOWNWARD
		2007	FAR	NOT APPARENT
		2010	FAR	NOT APPARENT
		2014	FAR	UPWARD
LE0530*	Willow Gulch Spring{ XE "Spring" }	2002	FAR	DOWNWARD
		2007	PFC	No trend recorded
LE0531	Unnamed Spring{ XE "Spring" } in Sooner Gulch	2002	NF	No trend recorded
		2007	FAR	DOWNWARD
		2010	PFC	NOT APPARENT
LE0532*	Soda Spring{ XE "Spring" }	2002	FAR	DOWNWARD

Table 3-7
PFC Assessment Results for Lentic{ XE "Lentic" } Sites

ID	Riparian/Wetland { XE "Wetland" } Area	Year Assessed	Rating	Trend
		2007	NF	No trend recorded
		2010	FAR	DOWNWARD
		2014	FAR	DOWNWARD
LE0533*	East 50-mile Spring{ XE "Spring" }	2002	NF	NOT APPARENT
		2007	NF	No trend recorded
		2010	FAR	UPWARD
		2014	FAR	UPWARD
LE1513*	Sooner Water	2002	FAR	NOT APPARENT
		2007	PFC	No trend recorded
LE1514	Upper Cottonwood Spring{ XE "Spring" }	2002	FAR	DOWNWARD
		2007	FAR	DOWNWARD
		2014	FAR	UPWARD
LE1515	Pole Well Spring{ XE "Spring" }	2002	FAR	DOWNWARD
		2007	FAR	NOT APPARENT
LE1700*	Llellyn Spring{ XE "Spring" }	2002	PFC	No trend recorded
LE1704	Cave Spring{ XE "Spring" }	2002	PFC	No trend recorded
		2007	FAR	NOT APPARENT
		2014	PFC	No trend recorded
LE1714	Lower Cottonwood Spring{ XE "Spring" }	2007	PFC	No trend recorded
Spencer Bench				
LE0567	Below Harry Cowles Spring{ XE "Spring" }		FAR	NOT APPARENT
Upper Cattle				
LE0028	Joe Perdence Spring{ XE "Spring" }	2002	FAR	NOT APPARENT
		2010	PFC	NOT APPARENT
LE0029	Harris Wash Corral Spring{ XE "Spring" }	2002	PFC	No trend recorded

Table 3-7
PFC Assessment Results for Lentic{ XE "Lentic" } Sites

ID	Riparian/Wetland { XE "Wetland" } Area	Year Assessed	Rating	Trend
LE0030	Upper Cattle	2002	PFC	No trend recorded
LE0040	Slickrock Water	2002	PFC	No trend recorded
LE0042	Kent Spring{ XE "Spring" }	2002	FAR	NOT APPARENT
		2010	PFC	No trend recorded
LE1703	Seep/Hanging Garden	2002	PFC	No trend recorded
Upper Hackberry				
LE0059	Center Knoll Spring{ XE "Spring" }	2003	PFC	No trend recorded
LE0505	Rock Springs{ XE "Spring" }	2001	FAR	DOWNWARD
Upper Paria				
LE0514	Unnamed Spring{ XE "Spring" }	2001	FAR	DOWNWARD
LE0525	Artesian Well	2002	PFC	No trend recorded
LE0527	Henrieville Spring{ XE "Spring" }	2002	PFC	No trend recorded
LE1200	Sheep Creek Above Dam at Skutumpah Road Crossing	2001	FAR	UPWARD
LE1201	Sheep Creek Below Dam	2001	PFC	No trend recorded
LE1202	Sheep Creek Below Dam	2001	FAR	DOWNWARD
Upper Warm Creek				
LE0023	John Henry Spring{ XE "Spring" }	2002	PFC	No trend recorded
LE0024	Clints Canyon Spring{ XE "Spring" }	2002	PFC	No trend recorded
LE0025*	Gunsight Spring{ XE "Spring" }	2002	PFC	No trend recorded
LE0026*	Water Canyon Spring{ XE "Spring" }	2002	FAR	NOT APPARENT
Varney Griffin				
LE0554	Unnamed (Varney-Griffin)	2002	PFC	No trend recorded

Table 3-7
PFC Assessment Results for Lentic{ XE "Lentic" } Sites

ID	Riparian/Wetland { XE "Wetland" } Area	Year Assessed	Rating	Trend
Vermillion				
LE0001	Sand Spring{ XE "Spring" }	2000	FAR	DOWNWARD
		2013	PFC	No trend recorded
LE0002	Cole Spring{ XE "Spring" }	2000	NF	No trend recorded
		2013	PFC	No trend recorded
LE0003	Nephi Spring{ XE "Spring" }	2000	NF	No trend recorded
		2013	FAR	UPWARD
LE0004	Brown Spring{ XE "Spring" }	2000	FAR	NOT APPARENT
		2013	PFC	No trend recorded
LE0006	Fin Little Spring{ XE "Spring" }	2000	NF	No trend recorded
		2007	FAR	UPWARD
Willow Gulch				
LE0521	Calf Creek Headspring	2002	PFC	No trend recorded
LE0523	Calf Creek	2002	PFC	No trend recorded
LE0524	Lower Calf Creek	2002	PFC	No trend recorded
Wire Grass				
LE0021*	Wiregrass Spring{ XE "Spring" }	2001	FAR	DOWNWARD

Source: BLM 2014
*Indicates site is in Glen Canyon
PFC: proper functioning condition
FAR: functioning-at-risk
NF: nonfunctional

Table 3-8
PFC Assessment Results for Lotic{ XE "Lotic" } Sites

ID	Riparian/Wetland { XE "Wetland" } Area	Year Assessed	Rating	Trend	Miles
Alvey Wash					
LO0025	Alvey Wash	2001	FAR	UPWARD	4.832
LO0066	Clay Gorge	2002	FAR	DOWNWARD	0.499
LO0067	Allens Creek	2002	FAR	DOWNWARD	0.868
LO0207	Upper Valley	2003	NF	NOT APPARENT	7.346
Antone Flat					
LO0044	Pine Creek	2002	FAR	DOWNWARD	3.741
LO0202	Death Hollow	2003	PFC	NOT APPARENT	13.913
Big Bowns Bench					
LO0033	Horse Canyon	2001	FAR	UPWARD	3.681
LO0034	Horse Canyon	2001	FAR	NOT APPARENT	0.873
LO0197*	Escalante River	1997	PFC	NOT APPARENT	7.223
LO0198	Escalante River	1997	PFC	NOT APPARENT	14.481
Big Horn					
LO0001	Harris	2001	FAR	NOT APPARENT	1.333
		2010	FAR	UPWARD	1.333
Boulder Creek					
LO0036	Dry Hollow	2001	PFC	No trend recorded	5.747
LO0143	Boulder Creek	2001	PFC	No trend recorded	4.185
LO0144	Boulder Creek	2001	PFC	No trend recorded	1.214
LO0151	Boulder Creek	2001	FAR	NOT APPARENT	5.869
LO0177	Boulder	2002	PFC	No trend recorded	0.979
Circle Cliffs					
LO0146	Unnamed	2001	PFC	No trend recorded	0.45
LO0147	Gulch	2001	FAR	DOWNWARD	4.418
		2007	FAR	NOT APPARENT	4.418
		2012	NOT RATED	No trend recorded	4.418
LO0148	Unnamed	2001	PFC	No trend recorded	0.363

Table 3-8
PFC Assessment Results for Lotic{ XE "Lotic" } Sites

ID	Riparian/Wetland { XE "Wetland" } Area	Year Assessed	Rating	Trend	Miles
LO0149	Gulch	2001	PFC	No trend recorded	1.236
LO0150	Water Canyon	2001	PFC	No trend recorded	1.455
		2012	PFC	No trend recorded	1.455
LO0152	Gulch	2001	FAR	DOWNWARD	2.736
		2007	PFC	No trend recorded	2.736
LO0153	Gulch	2001	FAR	NOT APPARENT	2.208
		2007	FAR	DOWNWARD	2.208
LO0154	Unnamed (Laminite Arch)	2001	FAR	NOT APPARENT	1.485
		2007	FAR	NOT APPARENT	1.485
Collet					
LO1005	Camp Spring/{ XE "Spring" }R. Hand Collet	2003	NF	No trend recorded	0.789
		2012	FAR	NOT APPARENT	0.559
LO1006	Middle R. Hand Collet	2003	NF	No trend recorded	0.463
		2012	NOT RATED	No trend recorded	0.463
LO1007	Sarah Anne	2001	NF	No trend recorded	0.275
		2012	FAR	NOT APPARENT	0.275
LO1008	Lower R. Hand Collet	2003	FAR	NOT APPARENT	3.205
		2012	PFC	No trend recorded	2.707
Cottonwood					
LO0007	Cottonwood	2001	FAR	NOT APPARENT	1.244
		2007	FAR	UPWARD	1.244
LO0008	Cottonwood	2001	FAR	DOWNWARD	1.259
		2007	FAR	UPWARD	1.259
LO0009	Cottonwood	2001	PFC	No trend recorded	0.769

Table 3-8
PFC Assessment Results for Lotic{ XE "Lotic" } Sites

ID	Riparian/Wetland { XE "Wetland" } Area	Year Assessed	Rating	Trend	Miles
LO0010	Cottonwood	2001	FAR	NOT APPARENT	1.635
		2014	PFC	No trend recorded	1.635
LO0011	Cottonwood	2001	NF	No trend recorded	1.299
LO0012	Cottonwood	2001	FAR	DOWNWARD	3.198
		2007	FAR	UPWARD	3.198
LO0014	Cottonwood	2001	FAR	UPWARD	2.91
LO0019	Paria	2001	FAR	DOWNWARD	2.185
LO0020	Paria	2001	FAR	NOT APPARENT	4.827
LO0021	Paria	2001	FAR	UPWARD	4.374
LO0113	Hackberry	2001	PFC	No trend recorded	1.83
LO0118	Paria	2001	FAR	UPWARD	9.263
LO0119	Paria	2001	NF	No trend recorded	1.374
		2007	NF	No trend recorded	1.374
LO0120	Paria	2001	FAR	NOT APPARENT	0.883
		2007	FAR	UPWARD	0.883
LO0178	Snake	2002	FAR	NOT APPARENT	0.504
LO0179	Snake	2002	PFC	No trend recorded	0.544
LO0186	Hog Eye	2002	PFC	No trend recorded	0.842
LO0187	Kitchen Canyon	2002	FAR	NOT APPARENT	1.32
LO0206	Butler Valley Seeps	2003	PFC	NOT APPARENT	0.282
LO0503	Rush Beds	2001	PFC	No trend recorded	0.119
		2014	FAR	UPWARD	0.119
LO0504	Pump Canyon	2001	NF	No trend recorded	0.095
		2014	FAR	UPWARD	0.095
LO0505	N/A	2001	FAR	NOT APPARENT	0.237
		2014	PFC	No trend recorded	0.237

Table 3-8
PFC Assessment Results for Lotic{ XE "Lotic" } Sites

ID	Riparian/Wetland { XE "Wetland" } Area	Year Assessed	Rating	Trend	Miles
LO0506	N/A	2001	PFC	No trend recorded	0.277
Deer Creek					
LO0141	Gulch	2001	PFC	No trend recorded	6.997
LO0142	Gulch	2001	FAR	NOT APPARENT	1.091
LO0155	Deer Creek	2001	PFC	No trend recorded	3.634
LO0157	Hot Canyon Reach 1	2002	PFC	No trend recorded	0.648
LO0158	Hot Canyon	2002	FAR	NOT APPARENT	1.358
LO0159	Slickrock Canyon	2002	PFC	No trend recorded	2.855
LO0160	Cottonwood	2002	PFC	No trend recorded	4.429
LO0161	Deer Creek	2002	PFC	No trend recorded	1.762
LO0175	Boulder Creek	2002	PFC	No trend recorded	4.175
LO0177	Boulder	2002	PFC	No trend recorded	0.979
LO0183	Deer Creek	2002	PFC	No trend recorded	3.342
LO0198	Escalante River	1997	PFC	NOT APPARENT	14.481
Dry Hollow					
LO0036	Dry Hollow	2001	PFC	No trend recorded	5.747
Escalante River					
LO0028*	25 Mile	2001	FAR	NOT APPARENT	10.68
LO0038*	Harris	2001	PFC	No trend recorded	8.675
LO0045*	Coyote Gulch	2002	PFC	No trend recorded	7.812
LO0046*	Coyote Gulch	2002	FAR	UPWARD	5.359
LO0073*	Scorpion Gulch	2002	PFC	No trend recorded	0.595
LO0078*	Hurricane Wash	2002	PFC	No trend recorded	1.632
LO0196*		1997	PFC	NOT APPARENT	12.39

Table 3-8
PFC Assessment Results for Lotic{ XE "Lotic" } Sites

ID	Riparian/Wetland { XE "Wetland" } Area	Year Assessed	Rating	Trend	Miles
LO0197*	Escalante River	1997	PFC	NOT APPARENT	7.223
Flood Canyon					
LO0165	Glass Eye	2002	PFC	No trend recorded	0.219
LO0166	Seaman	2002	PFC	No trend recorded	0.271
LO0167	Seaman	2002	PFC	No trend recorded	0.118
LO0168	Seaman	2002	FAR	DOWNWARD	0.127
Fortymile Ridge					
LO0046*	Coyote Gulch	2002	FAR	UPWARD	5.359
LO0211*	Forty Mile Gulch	2003	PFC	NOT APPARENT	1.048
LO0212*	Forty Mile Gulch	2003	PFC	NOT APPARENT	1.951
Headwaters					
LO0039	Paradise R-1 (E. Fork)	2001	NF	No trend recorded	1.842
		2014	NF	No trend recorded	1.842
LO0040	Paradise (Mainstem) R2	2001	FAR	DOWNWARD	1.15
LO0041	Paradise (Mainstem) R3	2001	FAR	DOWNWARD	4.087
		2014	PFC	No trend recorded	4.087
LO0042	Last Chance (junction of Paradise with Escalante Canyon)	2001	FAR	DOWNWARD	4.592
		2014	NOT RATED	No trend recorded	4.592
LO0047	Last Chance Reach 5	2002	FAR	DOWNWARD	4.998
		2010	FAR	UPWARD	4.998
		2014	PFC	No trend recorded	4.998
LO0062	Drip Tank	2002	FAR	UPWARD	2.072
		2014	PFC	No trend recorded	2.072
LO0100	4 Mile	2001	FAR	DOWNWARD	0.916

Table 3-8
PFC Assessment Results for Lotic{ XE "Lotic" } Sites

ID	Riparian/Wetland { XE "Wetland" } Area	Year Assessed	Rating	Trend	Miles
LO0102	4 Mile	2001	PFC	No trend recorded	0.999
LO0103	4 Mile	2001	FAR	NOT APPARENT	1.801
LO0104	Tommy Smith	2001	FAR	UPWARD	4.194
LO0106	Wahweap	2001	FAR	UPWARD	2.978
LO0107	Headquarters Cabin Wash	2001	NF	No trend recorded	0.361
LO1002	Long Valley Canyon	2001	FAR	NOT APPARENT	0.327
LO1003	Long Valley Canyon	2001	PFC	No trend recorded	1.382
LO1004	Long Valley Canyon	2001	FAR	DOWNWARD	0.417
Hells Bellows					
LO0404	Flood Canyon Mouth	1999	FAR	NOT APPARENT	0
		2007	FAR	No trend recorded	0
Kings Bench					
LO0035	Horse Canyon	2001	FAR	NOT APPARENT	0.898
LO0050	Boulder Draw	2002	PFC	No trend recorded	0.954
LO0141	Gulch	2001	PFC	No trend recorded	6.997
LO0155	Deer Creek	2001	PFC	No trend recorded	3.634
LO0182	Deer Creek	2002	PFC	No trend recorded	2.412
LO0183	Deer Creek	2002	PFC	No trend recorded	3.342
LO0184	Sand Hollow	2002	PFC	No trend recorded	0.835
Lake					
LO0013	Aspen Patch	2002	PFC	No trend recorded	0.659
LO0051	Spencer Canyon	2002	FAR	DOWNWARD	0.525
LO0052	Spencer Canyon	2002	FAR	UPWARD	0.273
LO0053	Harry Cowles	2002	FAR	DOWNWARD	0.322
LO0054	Indian Gardens	2002	FAR	DOWNWARD	0.64
LO0055	Spencer Canyon	2002	FAR	DOWNWARD	0.728
LO0056	Spencer Canyon	2002	FAR	UPWARD	1.286
LO0162	Pleasant Grove	2002	FAR	DOWNWARD	0.453

Table 3-8
PFC Assessment Results for Lotic{ XE "Lotic" } Sites

ID	Riparian/Wetland { XE "Wetland" } Area	Year Assessed	Rating	Trend	Miles
		2007	FAR	UPWARD	0.453
LO0163	S. tributary to Pleasant Grove	2002	PFC	No trend recorded	0.239
LO0164	Pinto Mare	2002	PFC	No trend recorded	0.417
LO0169	Steer	2002	FAR	UPWARD	0.934
LO0170	Unnamed 1 (tributary to Blackburn Canyon)	2002	FAR	DOWNWARD	0.715
LO0171	Unnamed	2002	PFC	No trend recorded	0.231
LO0510	East Spencer Draw	2003	PFC	No trend recorded	0.309
LO0511	Lake Draw	2003	PFC	No trend recorded	0.746
LO1000	Lake	2002	PFC	No trend recorded	0.52
LO1001	Lake	2002	PFC	No trend recorded	0.601
Last Chance					
LO0026	Willow Gulch	2001	FAR	DOWNWARD	0.602
		2010	PFC	No trend recorded	0.602
LO0032	Left Hand Collet	2001	NOT RATED	No trend recorded	0
		2010	PFC	No trend recorded	0
LO0047	Last Chance Reach 5	2002	FAR	DOWNWARD	4.998
		2010	FAR	UPWARD	4.998
		2014	PFC	No trend recorded	4.998
LO0048*	Last Chance Reach 6	2002	FAR	NOT APPARENT	18.759
		2014	PFC	No trend recorded	18.759
LO0062	Drip Tank	2002	FAR	UPWARD	2.072
		2014	PFC	No trend recorded	2.072
LO0190	Lower Reese Canyon	2002	PFC	No trend recorded	1.174
LO0512	Rogers Canyon	2003	FAR	DOWNWARD	0.68

Table 3-8
PFC Assessment Results for Lotic{ XE "Lotic" } Sites

ID	Riparian/Wetland { XE "Wetland" } Area	Year Assessed	Rating	Trend	Miles
LO0513	Croton Canyon	2003	FAR	NOT APPARENT	0.503
LO1005	Camp Spring/{ XE "Spring" }R. Hand Collet	2003	NF	No trend recorded	0.789
		2012	FAR	NOT APPARENT	0.559
LO1009	Left Hand Collet	2003	FAR	NOT APPARENT	0.88
Long Canyon Stock Driveway					
LO0141	Gulch	2001	PFC	No trend recorded	6.997
LO0145	Gulch	2001	PFC	No trend recorded	1.13
LO0149	Gulch	2001	PFC	No trend recorded	1.236
Lower Cattle					
LO0004	25 Mile	2001	FAR	NOT APPARENT	0.574
		2010	FAR	UPWARD	0.574
LO0005	25 Mile	2001	NF	No trend recorded	3.031
LO0006	25 Mile	2001	FAR	UPWARD	2.477
		2010	PFC	No trend recorded	2.477
LO0028	25 Mile	2001	FAR	NOT APPARENT	10.68
LO0074*	Scorpion Gulch	2002	PFC	No trend recorded	1.975
Lower Hackberry					
LO0108	Hackberry	2001	PFC	No trend recorded	1.882
LO0109	Hackberry	2001	PFC	No trend recorded	1.588
LO0110	Hackberry	2001	FAR	NOT APPARENT	0.826
LO0111	Hackberry	2001	FAR	UPWARD	0.903
LO0112	Hackberry	2001	PFC	No trend recorded	2.744
LO0113	Hackberry	2001	PFC	No trend recorded	1.83
LO0501	Stone Donkey	2001	FAR	UPWARD	0.12

Table 3-8
PFC Assessment Results for Lotic{ XE "Lotic" } Sites

ID	Riparian/Wetland { XE "Wetland" } Area	Year Assessed	Rating	Trend	Miles
LO0502	Stone Donkey	2001	PFC	No trend recorded	0.106
Main Canyon (State)					
LO0076	Birch Creek	2002	FAR	DOWNWARD	3.608
LO0208	Upper Valley	2003	NF	NOT APPARENT	0.401
McGath Point					
LO0203	Willow Patch	2003	PFC	NOT APPARENT	2.562
LO0205	Sand Creek	2003	PFC	NOT APPARENT	13.103
LO0210	Sweetwater	2003	PFC	NOT APPARENT	1.79
Mollies Nipple					
LO0009A	Upper Box Elder Spring{ XE "Spring" }	2014	PFC	No trend recorded	0
Nipple Bench					
LO0507	Nipple Spring{ XE "Spring" }	2001	FAR	DOWNWARD	0.412
		2007	FAR	UPWARD	0.412
Phipps					
LO0029	Phipps	2001	PFC	No trend recorded	2.72
LO0044	Pine Creek	2002	FAR	DOWNWARD	3.741
LO0175	Boulder Creek	2002	PFC	No trend recorded	4.175
LO0198	Escalante River	1997	PFC	NOT APPARENT	14.481
LO0199	Escalante River	1997	PFC	NOT APPARENT	5.893
LO0200	Escalante River	2003	PFC	NOT APPARENT	7.356
LO0202	Death Hollow	2003	PFC	NOT APPARENT	13.913
LO0204	Escalante River	2003	PFC	NOT APPARENT	6.729
LO0205	Sand Creek	2003	PFC	NOT APPARENT	13.103
Pine Creek					
LO0043	Pine Creek	2002	PFC	No trend recorded	2.685
LO0044	Pine Creek	2002	FAR	DOWNWARD	3.741

Table 3-8
PFC Assessment Results for Lotic{ XE "Lotic" } Sites

ID	Riparian/Wetland { XE "Wetland" } Area	Year Assessed	Rating	Trend	Miles
Rock Creek-Mudholes					
LO0057	Pocket Hollow	2002	NF	No trend recorded	0.924
LO0058	Gates Draw	2002	NF	No trend recorded	0.38
LO0059	Little Valley Creek	2002	NF	No trend recorded	1.28
LO0060	Upper Little Valley	2002	NF	No trend recorded	0.646
LO0173	Rock	2002	FAR	NOT APPARENT	0.147
LO0174*	Rock	2002	PFC	No trend recorded	0.38
Salt Water Creek					
LO0202	Death Hollow	2003	PFC	NOT APPARENT	13.913
LO0205	Sand Creek	2003	PFC	NOT APPARENT	13.103
Soda					
LO0069*	Davis Gulch	2002	PFC	No trend recorded	3.156
LO0070*	Llewellen Canyon	2002	PFC	No trend recorded	1.395
LO0213*	Willow Gulch	2003	PFC	NOT APPARENT	1.454
LO0215*	Fifty Mile Gulch	2003	PFC	NOT APPARENT	2.217
LO0508*	Cottonwood Gulch	2002	PFC	No trend recorded	0.862
Steep Creek					
LO0150	Water Canyon	2001	PFC	No trend recorded	1.455
		2012	PFC	No trend recorded	1.455
Swallows Park					
LO0135	Bullrush Hollow	2001	NF	No trend recorded	1.198
LO0406	Lower Bullrush	1999	NF	NOT APPARENT	0
		2010	FAR	UPWARD	0
LO0407	Upper Bullrush Hollow	1999	NF	DOWNWARD	0

Table 3-8
PFC Assessment Results for Lotic{ XE "Lotic" } Sites

ID	Riparian/Wetland { XE "Wetland" } Area	Year Assessed	Rating	Trend	Miles
LO0408	Bullrush Hollow	1993	NF	No trend recorded	1.198
Upper Cattle					
LO0001	Harris	2001	FAR	NOT APPARENT	1.333
		2010	FAR	UPWARD	1.333
LO0002	Harris	2001	FAR	NOT APPARENT	5.732
LO0003	Harris	2001	PFC	No trend recorded	4.707
LO0004	25 Mile	2001	FAR	NOT APPARENT	0.574
		2010	FAR	UPWARD	0.574
LO0005	25 Mile	2001	NF	No trend recorded	3.031
LO0006	25 Mile	2001	FAR	UPWARD	2.477
		2010	PFC	No trend recorded	2.477
LO0032	Left Hand Collet	2001	NOT RATED	No trend recorded	0
		2010	PFC	No trend recorded	0
LO0037	Harris	2001	FAR	UPWARD	2.804
LO0038	Harris	2001	PFC	No trend recorded	8.675
LO1008	Lower R. Hand Collet	2003	FAR	NOT APPARENT	3.205
		2012	PFC	No trend recorded	2.707
Upper Paria					
LO0015	Paria	2001	FAR	DOWNWARD	1.934
LO0016	Paria	2001	FAR	UPWARD	1.518
		2012	PFC	No trend recorded	1.518
LO0017	Paria	2001	FAR	UPWARD	2.53
		2012	FAR	UPWARD	2.53
LO0018	Paria	2001	FAR	NOT APPARENT	4.982
LO0019	Paria	2001	FAR	DOWNWARD	2.185
LO0114	Willis	2001	NF	No trend recorded	2.886
LO0115	Willis	2001	NF	No trend recorded	2.09

Table 3-8
PFC Assessment Results for Lotic{ XE "Lotic" } Sites

ID	Riparian/Wetland { XE "Wetland" } Area	Year Assessed	Rating	Trend	Miles
LO0116	Willis	2001	FAR	DOWNWARD	0.202
LO0117	Willis	2001	NF	No trend recorded	1.173
LO0121	Sheep Creek	2001	FAR	UPWARD	0.828
LO0122	Heward Creek	2001	FAR	NOT APPARENT	0.426
LO0123	Heward Creek	2001	PFC	No trend recorded	0.18
LO0127	Henrieville	2001	FAR	UPWARD	2.842
LO0128	Henrieville	2001	FAR	NOT APPARENT	2.664
LO0129	Henrieville	2001	PFC	No trend recorded	1.843
LO0130	Little Creek	2001	PFC	No trend recorded	2.529
LO0131	Little Creek	2001	PFC	No trend recorded	1.482
LO0137	North Canyon	2001	FAR	NOT APPARENT	2.618
LO0138	Henrieville	2001	FAR	NOT APPARENT	2.024
LO0139	Henrieville	2001	NF	No trend recorded	0.361
LO0140	Little Creek	2001	NF	No trend recorded	1.619
LO0176	Deer Creek	2002	FAR	NOT APPARENT	1.762
Upper Warm Creek					
LO0063	Wesses	2002	FAR	UPWARD	1.963
LO0064	John Henry	2002	FAR	DOWNWARD	1.682
LO0065	Clints Canyon	2002	FAR	UPWARD	1.251
Varney Griffin					
LO0068	North Creek	2002	PFC	No trend recorded	5.784
LO0071	Varney Creek	2002	PFC	No trend recorded	2.572
LO0072	Varney Creek	2002	PFC	No trend recorded	2.87
LO0075	Birch Creek	2002	FAR	UPWARD	2.305
LO0076	Birch Creek	2002	FAR	DOWNWARD	3.608
LO0077	Left Hand Varney Creek	2002	FAR	UPWARD	0.994

Table 3-8
PFC Assessment Results for Lotic{ XE "Lotic" } Sites

ID	Riparian/Wetland { XE "Wetland" } Area	Year Assessed	Rating	Trend	Miles
LO0207	Upper Valley	2003	NF	NOT APPARENT	7.346
White Rock					
LO0050	Boulder Draw	2002	PFC	No trend recorded	0.954
Willow Gulch					
LO0180	Calf Creek	2002	PFC	No trend recorded	2.912
LO0181	Calf Creek	2002	PFC	No trend recorded	1.019
LO0199	Escalante River	1997	PFC	NOT APPARENT	5.893
LO0200	Escalante River	2003	PFC	NOT APPARENT	7.356
LO0203	Willow Patch	2003	PFC	NOT APPARENT	2.562
LO0205	Sand Creek	2003	PFC	NOT APPARENT	13.103

Source: BLM 2014
*Indicates site is wholly or partially in Glen Canyon
PFC: proper functioning condition
FAR: functioning-at-risk
NF: nonfunctional

Springs{ XE "Spring" } and seeps also occur in the planning area. Springs occur where water flows from an underground aquifer to the surface and usually emerge from a single point. Seeps are similar to springs, though they generally have a lower flow rate than springs and emerge over a larger area, having no well-defined origin. Due to their higher volume, springs have the potential to form a stream and create riparian habitat (United States Fish and Wildlife Service [USFWS], undated). Springs are important components of the desert ecosystem for a number of reasons. Historically, springs were the only reliable source of water for humans and animals, other than perennial{ XE "Perennial" } streams, which are limited in the planning area. Springs are biodiversity hotspots that support a large proportion of the aquatic and riparian species in arid regions (Sada and Pohlman 2002).

Noxious Weeds and Nonnative, Invasive Plants

Invasive plants{ XE "Invasive Species" } are found in the planning area, particularly in areas disturbed by surface activities. These plants displace native plant communities and degrade wildlife habitat. **Table 3-9**, Utah Noxious Weeds Occurrence, lists the Utah designated noxious weeds{ XE "Noxious Weed" } that may occur in the region, the current management classes for each species, and their occurrence in the planning area. While not listed in **Table 3-9**, Russian olive (*Elaeagnus angustifolia*), camelthorn (*Alhagi pseudalhagi*), and Ravenna grass (*Saccharum ravennae*) occur in Glen Canyon.

Class A weeds have a relatively low population size within the state and are of highest priority; they are considered an *Early Detection Rapid Response* weed.

Class B weeds have a moderate population throughout the state and generally are thought to be controllable in most areas.

Class C weeds are found extensively in the state and are thought to be beyond control. Statewide efforts would generally be toward containment of smaller infestations.

In the Colorado Plateau ecoregion{ XE "Ecoregion" }, cheatgrass (*Bromus tectorum*) has been identified as a significant change agent; the species can alter ecosystem processes, such as fire regimes, has the potential to expand in distribution in spite of human and natural disturbances, and adapts and shifts its range in response to climate change (Bryce et al. 2012, p. 96). However, cheatgrass is not considered as much of a threat in the planning area as in other parts of the ecoregion.

Table 3-9
Utah Noxious Weeds Occurrence

Common Name	Scientific Name	Class	Occurrence[1]
Bermuda grass	*Cynodon dactylon*	B	X
Canada thistle	*Cirsium arvense*	C	
Dalmatian toadflax	*Linaria dalmatica*	B	
Diffuse knapweed	*Centaurea diffusa*	A	
Dyers woad	*Isatis tinctoria*	B	
Field bindweed	*Convolvulus arvensis*	C	X
Hoary cress	*Cardaria* spp.	B	X
Houndstongue	*Cynoglossum officinale*	C	
Johnsongrass	*Sorghum halepense*	A	X
Musk thistle	*Carduus nutans*	B	
Perennial{ XE "Perennial" } pepperweed	*Lepidium latifolium*	B	
Poison hemlock	*Conium maculatum*	B	X
Purple loosestrife	*Lythrum salicaria*	A	
Quackgrass	*Elytrigia repens*	C	X
Russian knapweed	*Acroptilon repens*	B	X
Tamarisk (salt cedar)	*Tamarix* spp.	C	X
Scotch thistle	*Onopordum acanthium*	B	X
Spotted knapweed	*Centaurea biebersteinii*	A	
Squarrose knapweed	*Centaurea virgate*	B	
Yellow starthistle	*Centaurea solstitialis*	A	

Sources: Utah Weed Control Association 2014; Belliston et al. 2009
[1]Includes species that occur or have occurred in or near the planning area.

The BLM has inventoried and mapped some of the planning area to determine the extent of invasive plants{ XE "Invasive Species" }. In 2012, the BLM inventoried more than 4,600 acres in the Alvey Wash watershed, focusing on Russian olive and tamarisk. Other targeted species included hoary cress, Russian knapweed, and perennial{ XE "Perennial" } pepperweed, though

no infestations of these species were identified. Within the inventoried area, biologists detected nearly 150 acres of Russian olive and more than 200 acres of tamarisk (Edvarchuk and Ransom 2012, p. 39). Rangeland health{ XE "Rangeland Health" } assessments{ XE "Rangeland Health, Assessment" } found that tamarisk (found at 68 percent of riparian sites), yellow clover (37 percent), and cheatgrass (32 percent) were common at riparian sites assessed between 2000 and 2003 (BLM 2006). Cheatgrass is the predominant nonnative, invasive species in upland sites, having been found in 54 percent of sites assessed; cheatgrass was a dominant species in over 20 percent of those sites (BLM 2006).

Over a six-year study in the planning area, researchers identified four patterns across the landscape related to invasive plants{ XE "Invasive Species" } (Stohlgren et al. 2006, p. 282). The identified patterns were as follows:

- Native and nonnative plant species thrive in rare mesic habitats that are high in soil fertility, moisture, and leaf cover.
- Highly disturbed habitats, such as post-burn areas, have exceedingly high levels of plant invasions related to the destruction of soil crusts and local displacement of native species by nonnative species.
- More common xeric habitats are high in endemic species and have considerably lower nonnative species and cover.
- A plant species' life history can be an important predictor of successful invasion, because it integrates specific environmental variables.

3.2.2 Trends

Upland Vegetation

Vegetation communities in the Colorado Plateau ecoregion{ XE "Ecoregion" } and within the planning area have historically been affected primarily by invasive species{ XE "Invasive Species" } conversion and uncharacteristic native vegetation (such as pinyon-juniper expansion). REA data show that the largest changes within the planning area occur in mixed mountain shrubland, where over 85 percent has been affected by uncharacteristic native vegetation, likely pinyon-juniper expansion. (However, this is not true for mixed mountain shrubland in Glen Canyon.) Pinyon-juniper shrubland has also experienced substantial changes, with over 20 percent affected by invasive species, including annual invasive grasses. Disturbances, such as fire and particularly mechanical treatments, have also affected vegetation communities in the planning area. The greatest effects from disturbances have occurred in the big sagebrush shrubland community, with 10 percent of the vegetation community affected (BLM GIS 2014; REA GIS 2012). Other influences in the ecoregion include urbanization and roads, agriculture, and fire, though these have had less of an effect in the planning area (Bryce et al. 2012, p. 86; BLM GIS 2014; REA GIS 2012). Depending on the characteristics of the plant community and the type and intensity of grazing, livestock grazing has also had effects on vegetation, such as changes in plant species composition, aboveground primary productivity, and root and soil attributes (Milchunas 2006).

Rangeland health{ XE "Rangeland Health" } assessments{ XE "Rangeland Health, Assessment" } and range monitoring indicate trends and issues in different vegetation communities. These

trends are not always in agreement with the larger-scale REA data. This is because the rangeland health assessments are site specific, evaluating on-the-ground conditions, as opposed to the REA, which is based on modeling assumptions. Further, recent rangeland health assessments were conducted during a drought, which has influenced upland vegetation. Most oak woodland and pinyon-juniper communities evaluated during rangeland health assessments had none to slight departure from reference conditions (BLM 2006). Many of the blackbrush, sagebrush grassland seedings{ XE "Seeding" }, desert shrub, and grassland and meadow sites showed moderate, moderate to extreme, and extreme departures from reference conditions (BLM 2006).

Notable trends and departures from reference conditions for upland vegetation are described below:

Blackbrush Rangeland health{ XE "Rangeland Health" } assessments{ XE "Rangeland Health, Assessment" } identified departures from reference conditions, due to gully formation, increased surface water flow, higher wind scour, loss of biological soil crust{ XE "Biological Soil Crust" }, soil erosion, exotics invasion (e.g., broom snakeweed, cheatgrass, and Russian thistle), and species composition loss. Departures were noted at Fortymile Ridge, Last Chance, Lower Cattle, Nipple Bench, Rock Creek-Mudholes, and Soda allotments (BLM 2006).

Desert shrub Rangeland health{ XE "Rangeland Health" } assessments{ XE "Rangeland Health, Assessment" } identified departures from reference conditions due to shifts in species composition, loss of biological soil crusts{ XE "Biological Soil Crust" }, rill and gully formation, reduced shrub vigor, increased cover of broom snakeweed, exotics invasion (e.g., cheatgrass, red brome, Indian wheat, and Russian thistle), soil loss, and soil erosion. Departures were noted at Cottonwood, Coyote, Headwaters, Last Chance, Lower Cattle, Nipple Bench, and Upper Paria allotments (BLM 2006).

Sagebrush grassland seedings{ XE "Seeding" } Most of these seedings are composed of crested wheatgrass-Russian wildrye. With the recent drought, many of these mature seedings have decreased production or died out. Departure from reference conditions has been noted due to a reduction in biological soil crust{ XE "Biological Soil Crust" }, surface water flow, compaction, soil loss, reduced vigor, rill and gully formation, decline in cover and abundance of perennial{ XE "Perennial" } grasses, reduced shrub vigor, encroachment by Utah juniper and pinyon pine, increased weed cover (e.g., Russian thistle, musk mustard, flixweed, and cheatgrass), shift in functional/structural groups, soil erosion increase, and bare ground. Departures were noted at Circle Cliffs, Collet, Cottonwood, Coyote, Death Hollow, Fortymile Ridge, Headwaters, Hells Bellows, Lake, Last Chance, Mollie's Nipple, Soda, Swallow Park, Upper Paria, and Vermillion allotments (BLM 2006).

Seedings{ XE "Seeding" } Some sites showed departure from reference conditions, due to erosion, rill and gully formation, compaction, reduced composition of desirable species, and increased cover of exotic annual plants, such as cheatgrass and Scotch thistle. Seeded species die-off was noted, likely due to drought. Departures were noted in the Vermilion allotment (BLM 2006).

Grassland and Meadow Some sites showed departure from reference conditions due to soil erosion, pedestal formation[9], loss of biological soil crust{ XE "Biological Soil Crust" }, bare ground, soil compaction, exotics invasion (e.g., Russian thistle, musk mustard, and cheatgrass), and decrease in perennial{ XE "Perennial" } grasses. Departures were noted at Coyote, Lake, Lower Cattle, Nipple Bench, Rock Creek-Mudholes, and School Section allotments (BLM 2006).

Desert and Semidesert sand Originally these sites were likely a shrub-steppe type composed of *Atriplex canescens*-bunchgrass (*Achnatherum* sp. and *Hesperostipa* sp.). The change in conditions is possibly due to overgrazing in the past, possibly before World War II. This could have eliminated biological soil crusts{ XE "Biological Soil Crust" } and grass cover, followed by wind mobilization of sands, especially during periods of drought (Bowker et al. 2012).

Pinyon-juniper woodlands This vegetation type has expanded over the last century into grassland and shrubland ecosystems throughout the western United States, though this has not been prevalent in GSENM. Livestock grazing, changes in fire regimes, and increasing atmospheric carbon dioxide concentrations are thought to be more recent drivers of pinyon-juniper woodland distribution. However, one study suggests that past climate has been more important than livestock grazing in influencing pinyon-juniper persistence in the planning area (Barger et al. 2009, p. 536). Further, many old (over 200 years) pinyon pines were found within the planning area, indicating that pinyon pines have long been established within the planning area (Barger et al. 2009, p. 537). Departures from Rangeland Health{ XE "Rangeland Health" } Standards were noted at Death Hollow, Lake, Last Chance, Mollie's Nipple, Upper Paria, Vermilion, and Headwaters allotments. The reason for this was due to decreased cool season perennial{ XE "Perennial" } grasses, erosion, bare ground, rill and gully formation, litter movement offsite, loss of biological soil crusts{ XE "Biological Soil Crust" }, decreased vigor of shrubs and perennial grasses, and increased cover of weedy annuals (e.g., cheatgrass; BLM 2006).

Riparian and Wetland{ XE "Wetland" } Vegetation

Riparian systems throughout the Colorado Plateau ecoregion{ XE "Ecoregion" } have experienced substantial changes due to direct conversion to other uses, changes in the natural flow regimes and suppression of fluvial processes, livestock grazing, and invasive species{ XE "Invasive Species" } (e.g., tamarisk; Bryce et al. 2012, p. 88). Given their productivity and importance to animals, riparian areas{ XE "Riparian Area" } have a greater potential to be impacted by livestock grazing compared with adjacent less productive communities, but also potential for more rapid recovery from disturbance because of faster growth rates of the vegetation (Milchunas 2006, p. 80).

In the planning area, PFC assessments noted impacts from heavy use by livestock of riparian and wetland{ XE "Wetland" } areas, such as increased sloughing and erosion of banks from hoof action and trampling of vegetation near springs{ XE "Spring" }, in many of the allotments assessed. Other impacts noted included dewatering, loss of riparian and wetland vegetation, poor recruitment of native species, and replacement of native species by tamarisk, Russian olive, and annual grasses and forbs. Some seeps and springs have been drying up, likely due to the recent drought. In many areas, a change to existing grazing administration was identified as

[9] Pedestal formation occurs when individual grass plants are elevated due to compaction of surrounding soils.

needed to meet or make significant progress toward meeting the rangeland health{ XE "Rangeland Health" } standard for riparian and wetland areas (BLM 2006). To address these issues, the BLM and permittees have taken a variety of measures, as presented in **Table 3-4**, Allotments Not Meeting Rangeland Health{ XE "Rangeland Health" } Standards and Actions Taken Since 2006~~Allotments Not Meeting Rangeland Health{ XE "Rangeland Health" } Standards~~ and seeps, repairing existing infrastructure, and changing season of use.

Since 2000, monitoring has occurred on approximately 360 miles of streams (i.e., lotic{ XE "Lotic" } reaches) and at more than 100 seeps or springs{ XE "Spring" } (i.e., lentic{ XE "Lentic" } sites). The BLM has conducted additional PFC assessments in the Circle Cliffs, Collet, Cottonwood, Ford Well, Fortymile Ridge, Headwaters, Hells Bellows, Last Chance, Lower Cattle, Mollies Nipple, Soda, Swallow Park, Upper Paria, and Vermilion allotments since those assessments done for the 2006 rangeland health{ XE "Rangeland Health" } determinations (see **Table 3-7**, PFC Assessment Results for Lentic{ XE "Lentic" } Sites~~PFC Assessment Results for~~ Assessment Results for Lotic{ XE "Lotic" } Sites~~PFC Assessment Results for Lotic{ XE "Lotic" }~~

In 2013, Garfield County contracted riparian PFC assessments on all riparian areas{ XE "Riparian Area" } in the Cottonwood, Death Hollow, Lower Cattle, Mollies Nipple, and Soda allotments. These allotments are part of a group of 18 allotments found to be not meeting Standard 2 in the 2006 rangeland health{ XE "Rangeland Health" } determinations for GSENM.

The results of these assessments indicated that the BLM management actions to correct riparian issues associated with livestock grazing improved rangeland health{ XE "Rangeland Health" }. The report by the Garfield County contractor (Stager's Environmental Consulting 2014) concludes that Cottonwood, Death Hollow, and Lower Cattle allotments are meeting land health standards, likely as a result of BLM management. The report also concludes that Mollies Nipple and Soda allotments are likely not meeting land health standards due to livestock grazing, but that the BLM has made measurable progress toward meeting standards since the 2006 determination (Stager's Environmental Consulting 2014). Overall, most of the riparian and wetland{ XE "Wetland" } sites evaluated show an improvement.

Noxious Weeds and Nonnative, Invasive Plants

Increased use of public land has contributed to the introduction and spread of noxious weeds{ XE "Noxious Weed" } and invasive plants{ XE "Invasive Species" } that are replacing native vegetation (BLM 2015). As ground disturbance and human visitation (e.g., recreationists) increase, the likelihood that noxious weeds and invasive plants would move into this disturbance also increases. Another source of potential noxious weed and invasive plant infestations is routine monument operations, such as road maintenance, firefighting, and even weed control operations (Edvarchuk and Ransom 2012, p. 41). Focused efforts have limited the spread and reduced the size of invasive plant populations in areas. Such efforts include spot treatment of noxious weeds, pre-emergent herbicide application prior to seeding{ XE "Seeding" } (targeting cheatgrass), mowing or Dixie harrowing and seeding, prescribed fire use, and follow-up seeding with native species post-treatment.

3.2.3 References

Barger, N. N., H. D. Adams, C. Woodhouse, J. C. Neff, and G. P. Asner. 2009. "Influence of livestock grazing and climate on pinyon pine (*Pinus edulis*) dynamics." *Rangeland Ecology and Management* 62:531-539.

Belliston, N., R. Whitesides, S. Dewey, J. Merritt, and S. Burmingham. 2009. Noxious Weed Field Guide for Utah. Internet website: http://extension.usu.edu/files/publications/publication/pub_8746541.pdf.

BLM (United States Department of the Interior, Bureau of Land Management). 2006. Rangeland Health{ XE "Rangeland Health" } Determination. BLM, Grand Staircase-Escalante National Monument, Utah.

_____. 2014. Information on PFC assessments provided by the BLM. Grand Staircase-Escalante National Monument, Utah.

_____. 2015. Programmatic Noxious Weed and Invasive Plant Management, Grand Staircase-Escalante National Monument. BLM, Grand Staircase-Escalante National Monument, Utah.

BLM GIS. 2014. Base GIS data on file with BLM's eGIS Server, used for calculations or figures to support the MMP{ XE "Monument Management Plan, Grand Staircase-Escalante National Monument (MMP 2000)" }-A. BLM, Grand Staircase Escalante National Monument, Utah.

Bowker, M. A., M. E. Miller, and R. T. Belote. 2012. Assessment of Rangeland Ecosystem Conditions, Salt Creek Watershed and Dugout Ranch, Southeastern Utah. United States Geological Survey Open-File Report 2012-1061, 56 p.

Bryce, S. A., J. R. Strittholt, B. C. Ward, and D. M. Bachelet. 2012. Colorado Plateau Rapid Ecoregional Assessment Report. Prepared for the United States Department of the Interior, Bureau of Land Management, Denver, Colorado.

Clements, C. D., D. N. Harmon, J. A. Young, and J. Knight, J. 2012. "*Diorhabda carinulata* and tamarisk control" (abstract). *Western Society of Weed Science* 64:8.

Cowardin, L. M., V. Carter, F. C. Golet, and E. T. LaRoe. 1979. Classification of wetlands{ XE "Wetland" } and deepwater habitats of the United States. United States Department of the Interior, Fish and Wildlife Service, Washington, DC. Internet website: http://www.npwrc.usgs.gov/resource/wetlands/classwet/.

Edvarchuk, K., and C. Ransom. 2012. An Inventory of Noxious and Invasive Plants in Grand Staircase-Escalante National Monument - 2012 Final Report. Prepared for the Bureau of Land Management by Utah State University; Plants, Soils, and Climate; Weed Science Research Project Report No. CR1202A.

EPA (United States Environmental Protection Agency). 2011. Level III Ecoregions{ XE "Ecoregion" } of the Continental United States, revised December 2011. National Health and Environmental Effects Research Laboratory, United States Environmental Protection Agency. Internet website: http://www.epa.gov/wed/pages/ecoregions/level_iii_iv.htm.

______. 2013. Primary distinguishing characteristics of Level III ecoregions{ XE "Ecoregion" } of the continental United States. September 2013. Internet website: http://www.epa.gov/wed/pages/ ecoregions/level_iii_iv.htm.

LANDFIRE. 2007. LANDFIRE Biophysical Setting Model Descriptions. Internet website: http://www.landfire.gov/national_veg_models_op2.php.

LANDFIRE GIS. 2015. Published GIS data of LANDFIRE ecological systems. Internet website: http://landfire.cr.usgs.gov/viewer/.

Leonard, S., G. Staidl, J. Fogg, K. Gebhardt, W. Hagenbuck, D. Pritchard. 1992. Procedures for Ecological Site Inventory with Special Reference to Riparian-Wetland{ XE "Wetland" } Sites. Technical Reference TR-1737-7. Bureau of Land Management. Denver, Colorado.

Milchunas, Daniel G. 2006. Responses of plant communities to grazing in the southwestern United States. Gen. Tech. Rep. RMRS-GTR-169. Fort Collins, Colorado: United States Department of Agriculture, Forest Service, Rocky Mountain Research Station.

NIFTT (National Interagency Fuels Technology Team). 2009. Using the LANDFIRE Biophysical Settings Model Descriptions. March 2009. Accessed online: http://www.landfire.gov/NationalProductDescriptions24.php.

NPS (United States Department of the Interior, National Park Service). 1999. Glen Canyon National Recreation Area Grazing Management Plan{ XE "Grazing Management Plan, Glen Canyon (GzMP 1999)" } and Finding of No Significant Impact. NPS, Glen Canyon National Recreation Area, Page, Arizona. August 1999.

______. 2006. Management Policies. United States Department of the Interior, National Park Service. ISBN 0-16-076874-8.

NVCS (National Vegetation Classification System). 2015. Macrogroups of the National Vegetation Classification Standard crosswalked with LANDFIRE ecological systems. United States National Vegetation Classification. Internet website: www.usnvc.org.

REA GIS. 2012. Colorado Plateau Rapid Ecological Assessment. GIS data of biological soil crusts{ XE "Biological Soil Crust" } and sensitive soils. Bureau of Land Management. Internet website: http://www.blm.gov/ pgdata/etc/medialib/blm/wo/Communications_Directorate/public_affairs/landscape_approach/documents1.Par.84901.File.dat/COP_REA_Data_Catalog.pdf.

Sada, D. W., and K. F. Pohlman. 2002. "Spring{ XE "Spring" } inventory and monitoring protocols." Conference proceedings. Spring-fed Wetlands{ XE "Wetland" }: Important Scientific and Cultural Resources of the Intermountain Region.

Stager's Environmental Consulting. 2014. Final Report on Riparian and Proper Functioning Condition and Standards for Rangeland Health{ XE "Rangeland Health" } Updated Independent Evaluation for Allotment Livestock Management for the Cottonwood, Death Hollow, Lower Cattle, Mollies Nipple, School Section, Soda, and Vermilion Allotments. January 16, 2014.

Stohlgren, T. J., M. Miller, P. Evangelista, A. Crall, D. Guenther, N. Alley, M. Kalkhan. 2006. Landscape-scale assessment of Grand Staircase-Escalante National Monument. Learning from the Land, Grand Staircase-Escalante National Monument Science Symposium Proceedings 2006. Cedar City, Utah.

United States Army Corps of Engineers. 1987. Corps of Engineers Wetlands{ XE "Wetland" } Delineation Manual. Technical Report Y-87-1. Waterways Experiment Station. Vicksburg, Mississippi.

USFWS (United States Fish and Wildlife Service). Undated. The Springs{ XE "Spring" } and Seeps of Tennessee. Internet website: http://www.fws.gov/asheville/pdfs/Curricula-TNspringsandseeps.pdf.

Utah Weed Control Association. 2014. Utah's Noxious Weed List. Internet website: www.utah weed.org/weeds.html.

Zouhar, K. 2005. Elaeagnus angustifolia. In: Fire Effects Information System, [Online]. US Department of Agriculture, Forest Service, Rocky Mountain Research Station, Fire Sciences Laboratory (Producer). Internet website: http://www.fs.fed.us/database/feis/.

3.3 Soil Resources

The planning area is primarily in the Colorado Plateau ecoregion{ XE "Ecoregion" }, which is in portions of Utah, Colorado, New Mexico, and Arizona. The Colorado Plateau REA (Bryce et al. 2012) describes the ecoregion, which is an erosional landscape with wind and water working on layers of sedimentary rock. Soils of the ecoregion are relatively undeveloped, having formed in residuum from sedimentary rocks weathering in place. Across the ecoregion, the pattern of vegetative cover reflects the variability in geology, physiography, elevation, aspect, ground and surface water availability, and soil (texture, depth, and water-holding capacity).

Geologic and climatic features of Colorado Plateau drylands have produced weakly developed soils (Miller 2005). The physical and chemical characteristics of the soils closely match the shales, sandstones, limestones, and igneous materials from which they were derived. Geomorphic processes, such as erosion and deposition, have built on this to generate abrupt or gradational juxtapositions of landforms and soils differentiated, based on soil depth, particle size distributions, mineralogy, and degree of profile development. The effects of human activities and eolian dust inputs also influence soil characteristics. Additionally, wind can have important effects on the structure and functioning of dryland ecosystems. Wind strongly affects

evapotranspiration rates and, therefore, can modify the energy and water balances of plants and soils. Similar to water, wind is an important force driving the redistribution of soil resources both within and among ecosystems.

Semiarid and arid landscapes with sparse vegetation and biological soil crust{ XE "Biological Soil Crust" } cover lack redundancy in function (Bryce et al. 2012). In other words, when crust is eliminated, so too are the essential functions it provides: nitrogen fixation, carbon storage, dust and airborne nutrient capture, moisture retention, and microsites for native plant germination.

Soils in arid and semiarid regions are particularly critical to sustaining ecosystems because they are more vulnerable to degradation from a number of natural and artificially induced disturbances. Management practices may affect the ability of the various soils to maintain productivity by influencing such disturbances as displacement, compaction, erosion, organic matter alteration, and soil organism levels. When soil degrades in semiarid regions, natural processes are slow to restore site productivity. Soil bulk density (mass per unit volume), porosity, organic matter content, hydraulic conductivity, moisture content, nutrient content, and soil temperature are affected to various degrees by surface disturbance. In turn, these factors affect soil-water interactions, productivity, nutrient cycling, water holding capacity, and soil erosion rates.

Cryptobiotic crusts (biological soil crusts{ XE "Biological Soil Crust" }) are of significant biological interest. They play an important role throughout GSENM in stabilizing the highly erodible desert soils and providing nutrients to plants. Biological soil crusts are also recognized as a key conservation element in the Colorado Plateau REA (Bryce et al. 2012). Geologic uplift with minimal deformation and subsequent downcutting by streams has exposed large expanses of a variety of geologic strata, each with unique physical and chemical characteristics. These strata are the parent material for an array of unusual and diverse soils that support many different vegetative communities and numerous types of endemic plants and their pollinators. This presents an extraordinary opportunity to study plant speciation and community dynamics independent of climatic variables.

Soils are also part of the values and purposes for Glen Canyon. According to Management Policies (NPS 2006), the NPS will seek to understand and preserve the soil resources of parks and to prevent, to the extent possible, the unnatural erosion, physical removal, or contamination of the soil or its contamination of other resources. Superintendents will prevent or at least minimize adverse, potentially irreversible impacts on soils.

According to the Glen Canyon GzMP{ XE "Grazing Management Plan, Glen Canyon (GzMP 1999)" } (NPS 1999), the evolutionary and ecological processes of the soil (abiotic) ecosystem, which includes surface cover, microbial populations, soil nutrient cycling, and physical/chemical transformations, are critical to the protection of scientific processes and scenic values within Glen Canyon. The soils goal is to maintain the evolutionary and ecological processes of the soil ecosystem. The two soils objectives address collecting soil data and enhancing soil productivity and surface cover.

3.3.1 Current Conditions

Soil Characteristics

Most of the soils in the planning area are semiarid, young, and poorly developed. Chemical and biological soil development processes, such as rock weathering, plant material decomposition, organic matter accumulation, and nutrient cycling, proceed slowly in this environment. In many areas, natural or geologic erosion rates are too fast to develop distinct, deep soil horizons. Most soils are less than two feet deep to bedrock. The deeper soils are formed in recent alluvium. Almost all of the local soils are derived from sedimentary rock. The dominant topographic features are structural benches, mesas, valley floors, valley plains, alluvial fans, stream terraces, hills, cuestas, and mountainsides. The NRCS has completed soil surveys for the decision area (NRCS 2007, 2010).

Dominant soil orders in the decision area are aridisols (desert soil), entisols, and mollisols. Aridisols are dry soils that have low organic content. They are sparsely vegetated by drought- or salt-tolerant plants, so both wind and water erosion is severe. Entisols are soils that have little development, and most are basically unaltered from their parent material. Many different parent materials contribute to varied soil properties of entisols, and they are often found in very dry or cool locations. Mollisols form in semiarid to semi-humid areas and are characterized by a significant accumulation of humus in the surface horizon. These mineral soils are typically under native grass vegetation and are highly arable. In the decision area, approximately 828,300 acres are aridisols, 1,410,400 acres are entisols, and 14,900 acres are mollisols (BLM GIS 2014). In general, mollisols are more capable of forage production than aridisols and entisols.

Sensitive Soil

Soils that have characteristics that make them extremely susceptible to impacts and difficult to restore or reclaim are considered sensitive. **Figure 3-4**~~Figure 3-4~~, Sensitive Soils, is from the et al. 2012) and shows all classes of sensitive soils, including droughty (marked by little or no precipitation or humidity), shallow, hydric (soils permanently or seasonally saturated by water), gypsiferous (soils containing sufficient quantities of gypsum [calcium sulphate] to interfere with plant growth), salty, and calcareous (high calcium carbonate). The REA does not include data for all sensitive soils in the ecoregion{ XE "Ecoregion" }.

Soil degradation{ XE "Soil Degradation" } susceptibility is calculated from the standard BLM soil interpretation "Site Degradation Susceptibility," which rates each soil for its susceptibility for soil degradation to occur during disturbance, which is a function of resistance to degradation. The ratings represent the relative risk of water and wind erosion, salinization, sodification, organic matter and nutrient depletion or redistribution, and loss of adequate rooting depth to maintain desired plant communities.

Biological Soil Crust

Technical Reference 1730-2, Biological Soil Crusts: Ecology and Management (United States Department of the Interior 2001), contains a description of biological soil crust{ XE "Biological Soil Crust" } distribution and factors influencing species composition, ecological roles, response to natural and human actions, management techniques, and monitoring methods. It also explains

various ecological roles of

Figure 3-4 Sensitive Soils

biological soil crusts{ XE "Biological Soil Crust" }. Much of the discussion that follows is based on comparative studies done on relatively small plots over short periods of time. Whether these results can be extrapolated to a landscape scale has not been demonstrated, but they are provided as the best available information for the region. These crusts are comprised of cyanobacteria, fungi, and lichen, growing in a symbiotic relationship on the soil surface (Bryce et al. 2012). Soil crusts serve as intermediaries between soil and vegetation, with important soil stabilization and nitrogen-fixing roles to play. Crusts on fine-textured soils often appear dark, rough, and pinnacled. Those on sand usually do not develop pinnacles and instead appear as a dark two-dimensional layer on the surface.

A variety of factors influence the distribution and composition of crust cover: elevation, soils and topography, disturbance, timing of precipitation, and vascular plant community structure. Total crust cover is inversely related to vascular plant cover; this is because less plant cover results in more surface available for colonization and growth of crustal organisms. Thus, when all crust types (cyanobacterial, moss, and lichen) are combined, cover is greatest at lower elevation inland sites (less than 3,280 feet [1,000 meters), compared with mid-elevation sites (3,280 to 8,200 feet [1,000 to 2,500 meters]). However, relative lichen and moss cover increases with elevation and effective precipitation until vascular plant cover precludes growth.

Stable or embedded rocks near or at the soil surface can increase the percent crust cover by perching water and armoring the surface against physical disturbances. Shallow soils often support a wide variety of cyanobacteria, lichens, and mosses, regardless of soil texture. Soil texture heavily influences the species composition of biological crust communities. More stable, fine-textured soils, such as gypsum and silty loams, support greater cover and more varied populations of cyanobacteria, lichens, and mosses than less stable, coarse-textured soils.

The intensity and type of soil surface disturbance, along with amount of time since disturbance, influence the composition of biological crusts. Intense disturbance results in bare soil.

The dominance of biological crusts is highly influenced by seasonal precipitation patterns. Ecoregions{ XE "Ecoregion" } that receive summer monsoons, such as the Sonoran Desert, tend to have a greater diversity of heterocystic cyanobacteria and lower lichen abundance.

The vertical and horizontal vascular plant structure of many arid and semiarid vegetation communities optimize growth of biological soil crusts{ XE "Biological Soil Crust" }. Vascular plants create windbreaks and shade, influencing how much moisture and light reach the soil surface. They also trap leaf litter, keeping the interspaces free of substantial or persistent litter cover. Invasive exotic plants generally decrease the structural diversity of native vascular plant communities by creating monocultures of densely spaced plants and by homogenizing litter distribution. They also lead to decreased biological crust cover and species richness in most ecosystems (United States Department of the Interior 2001).

Biological soil crusts{ XE "Biological Soil Crust" } aggregate surface soil and regulate the water's runoff-infiltration balance (Bowker et al. 2006). Crust organisms enhance the nutrient status of soils via nitrogen and carbon fixation, eolian silts and clay entrapment, and metals chelation, all of which affect vascular plant performance. Disturbance due to livestock grazing is the most widespread stressor of crust communities throughout their range. Depending on livestock

grazing intensity, livestock disturbance of soil crusts generally reduces lichen and moss components, diminishing ecosystem functions and services provided by crusts. Estimates of recovery time from disturbances can take years to decades.

Biological soil crusts{ XE "Biological Soil Crust" } are an important component of ecosystems in semiarid areas and may represent up to 70 percent of the living cover (Belnap 1995, p. 179). Research has shown that biological soil crusts provide important contributions to soil stabilization, hydrologic processes, nutrient cycling, and biological diversity in rangeland ecosystems (Miller 2008, p. 251). Biological soil crusts have a stronger direct effect on surface soil stability than plants or mycorrhizal fungi (Chaudhary et al. 2009, p. 116). Biological soil crusts are susceptible to damage by compression caused by grazing or off-road driving and can be negatively affected by fire. Researchers have developed models to facilitate the comparison between actual and potential cover and composition of biological soil crusts. This is so that sites in poor condition can be identified and management changes can be implemented (Miller 2008, p. 251; Bowker et al. 2006, p. 519).

Due to the importance of biological soil crusts{ XE "Biological Soil Crust" } in rangeland health{ XE "Rangeland Health" }, biological soil crust integrity was also assessed in the planning area (Miller 2008). Quantitative data on biological soil crust composition, abundance, and distribution were compared to reference areas; ratings were informed by preliminary results from a concurrent project to develop a spatial predictive model of biological soil crust cover in GSENM (Bowker et al. 2006). The study found that fine-loamy soils associated with the semidesert loam ecological site{ XE "Ecological Site" } had high potential to support biological soil crust development (Miller 2008, p. 259). Given the sensitivity of soils and high biological soil crust potential of these sites and the importance that biological soil crusts play in soil stabilization and other rangeland health factors, the functional significance for biological soil crusts in these sites is particularly high (Miller 2008, p. 259).

Soil crusts are useful ecological indicators of desert condition because they are not only sensitive to disturbance but they respond to disturbances in predictable and quantifiable ways (Bryce et al. 2012). Maps of potential crust abundance indicate the *potential* quantitative cover of biological crusts and major crust constituents (mosses, lichens, and dark cyanobacterial crusts) across the Colorado Plateau (Figure 3-5~~Figure 3-5~~, Potential Early Successional Soil Crust, 3-6~~Figure 3-6~~, Potential Late Successional Soil Crust~~Potential Late Successional Soil Crust~~). potential distribution are indicative of the degree of departure from reference condition.

Late successional soil crusts may take decades to recover from disturbance, so they are not good short-term indicators of the appropriateness of current management actions; however, early successional stages and associated physical crusts can appear fairly quickly. The NPS monitors these early stages, because they can provide evidence of the effectiveness of management actions that can help stabilize soils.

Rangeland Health{ XE "Rangeland Health" } Standards

Utah's Standards for Rangeland Health{ XE "Rangeland Health" } and Guidelines for Grazing Management were developed in accordance with 43 CFR, Part 4180, to provide for conformance with the Fundamentals of Rangeland Health. Through conformance and attainment of Utah's Standards and Guidelines, Utah BLM ensures that the Fundamentals of Rangeland

Health are met. According to Standard 1, upland soils exhibit permeability and infiltration rates that sustain or improve site productivity,

Figure 3-5 Potential Early Successional Soil Crust

Figure 3-6 Potential Late Successional Soil Crust

considering the soil type, climate, and landform (see **Section 3.1**, Livestock Grazing, for Standard 1 indicators). The BLM ensures that grazing in Glen Canyon complies with the respective Utah and Arizona Standards for Rangeland Health{ XE "Rangeland Health" } and Guidelines for Grazing Management (NPS 1999, p. 10).

There are six livestock grazing allotments in the decision area that do not meet Standard 1, and livestock grazing was determined to be the causal factor{ XE "Causal Factor" } for not meeting Standard 1 on all six allotments. The six allotments are Circle Cliffs, Coyote, Mollies Nipple, Soda, Upper Paria, and Vermilion (BLM 2006). To address issues related to Standard 1, the BLM recommended a variety of changes to grazing management specific to each allotment.

Land Disturbance

The primary sources of land disturbances in GSENM and Glen Canyon are from livestock grazing and recreation. Livestock grazing and recreation are discussed in **Sections 3.1** and **3.5**, respectively.

3.3.2 Trends

Persistent wind and water soil erosion is a natural phenomenon in desert ecosystems. However, human activities, including past mining, recreation, and grazing, all disturb the soil surface, affecting protective crusts and vascular plants and exposing underlying soils to wind and water erosion (Bryce et al. 2012), potentially increasing natural erosion rates.

As stated above, six allotments did not meet Standard 1 in the 2006 Rangeland Health{ XE "Rangeland Health" } Determinations, due to livestock grazing. Since 2006, the BLM, in coordination with permittees, has made changes in those allotments. Such changes include seeding{ XE "Seeding" } restoration, restricting season of use, maintaining range improvements{ XE "Range Improvement" }, implementing voluntary nonuse, and removing feral cattle. As a result of these changes, many areas that did not meet standards are now making progress toward doing so, based on recent upland assessments. See **Table 3-4**, Allotments Not Meeting Rangeland Health{ XE "Rangeland Health" } Standards ~~Allotments Not Meeting Rangeland~~ information.

As mentioned in **Section 3.2**, Vegetation, issues identified in rangeland health{ XE "Rangeland Health" } assessments{ XE "Rangeland Health, Assessment" } in sagebrush grassland seedings{ XE "Seeding" } were a reduction in biological soil crust{ XE "Biological Soil Crust" }, a shift in functional/structural groups, increased soil erosion, and bare ground (BLM 2006).

3.3.3 References

Belnap, J. 1995. *Potential role of cryptobiotic soil crusts in semiarid rangelands. In:* Symposium on Ecology, Management, and Restoration of Intermountain Annual Rangelands, United States Forest Service, General Technical Report INT-GTR-313. General Technical Report INT-GTR-313. Washington, DC: DOI-U.S. Forest Service. Pp. 179-185.

Bowker, Matthew A., Jayne Belnap, and Mark E. Miller. 2006. "Spatial modeling of biological soil crusts{ XE "Biological Soil Crust" } to support rangeland assessment and monitoring." *Rangeland Ecology & Management* 59(5):519-529.

Bryce, S. A., J. R. Strittholt, B. C. Ward, and D. M. Bachelet. 2012. Colorado Plateau Rapid Ecoregional Assessment Report. Prepared for the United States Department of the Interior, Bureau of Land Management, Denver, Colorado.

BLM (United States Department of the Interior, Bureau of Land Management). 2006. Rangeland Health{ XE "Rangeland Health" } Determination. BLM, Grand Staircase-Escalante National Monument, Utah.

BLM GIS. 2014. Base GIS data on file with BLM's eGIS Server, used for calculations or figures to support the MMP{ XE "Monument Management Plan, Grand Staircase-Escalante National Monument (MMP 2000)" }-A. BLM, Grand Staircase Escalante National Monument, Utah.

Chaudhary, V. B., M. A. Bowker, T. E. O'Dell, J. B. Grace, A. E. Redman, M. C. Rillig, and N. C. Johnson. 2009. "Untangling the biological contributions to soil stability in semiarid shrublands." *Ecological Applications* 19(1):110-122.

Miller, M. E. 2005. The Structure and Functioning of Dryland Ecosystems Conceptual Models to Inform Long-Term Ecological Monitoring. United States Geological Survey. Scientific Investigations Report 2005 5197.

______. 2008. "Broad-scale assessment of rangeland health{ XE "Rangeland Health" }, Grand Staircase-Escalante National Monument, USA." *Rangeland Ecology and Management* 61:249-262.

NPS (United States Department of the Interior, National Park Service). 1999. Glen Canyon National Recreation Area Grazing Management Plan{ XE "Grazing Management Plan, Glen Canyon (GzMP 1999)" } and Finding of No Significant Impact. NPS, Glen Canyon National Recreation Area, Page, Arizona. August 1999.

______. 2006. Management Policies. United States Department of the Interior, National Park Service. ISBN 0-16-076874-8.

NRCS (United States Department of Agriculture, Natural Resources Conservation Service). 2007. Soil Survey of Grand Staircase-Escalante National Monument Area, Parts of Kane and Garfield Counties, Utah.

______. 2010. Soil Survey of Glen Canyon National Recreation Area, Arizona and Utah. Issued 2010.

United States Department of the Interior. 2001. Technical Reference 1730-2, Biological Soil Crusts: Ecology and Management. Produced by BLM and United States Geological Survey.

3.4 Water Resources

The planning area is primarily in the Colorado Plateau ecoregion{ XE "Ecoregion" }, which is an erosional landscape with wind and water working on layers of sedimentary rock. The Colorado

Plateau receives winter precipitation from the Pacific Ocean and variable amounts of summer rain, such as monsoons. Human activities include rural development, surface and groundwater extraction, recreation, agriculture, and grazing and the introduction of invasive plants{ XE "Invasive Species" }. Across the ecoregion, patterns of vegetation are determined by ground and surface water availability, along with variability in geology, physiography, elevation, aspect, and soil (texture, depth, and water-holding capacity; Bryce et al. 2012).

The average annual precipitation for the planning area is 10 to 20 inches; areas around Lake Powell, which straddles Arizona and Utah, receive fewer than 10 inches, and areas north-northeast of Kanab, Utah, receive 20 to 30 inches. Escalante, Utah, has an average annual precipitation of 11 inches (Western Regional Climate Center 2015), most of which falls from November through March.

Key water resource features that guide land use allocation or management decisions include surface water and groundwater. Surface water may be ephemeral{ XE "Ephemeral" }, intermittent, or perennial{ XE "Perennial" }. With respect to livestock grazing, surface water includes streams, springs{ XE "Spring" }, ponds, and lakes. It also includes riparian areas{ XE "Riparian Area" } and wetlands{ XE "Wetland" }, which are discussed in **Section 3.2**, Vegetation. With respect to livestock grazing, groundwater includes aquifers that discharge to surface water or are pumped from wells.

The distribution of many of GSENM's unique vegetation communities, such as hanging gardens, is determined by its scarce and scattered water sources, such as streams, springs{ XE "Spring" }, seeps, tinajas, and wells. Perennial{ XE "Perennial" } streams are limited but include the Escalante River and many of its tributaries, segments of the Paria River and its tributaries, much of Wahweap Creek, and segments of a few smaller streams, such as Last Chance Creek.

Water resources are also part of the values and purposes for Glen Canyon. According to Management Policies (NPS 2006), the NPS will perpetuate surface water and groundwater as integral components of park aquatic and terrestrial ecosystems. Broad policy directions are provided for water rights, water quality, floodplains, wetlands{ XE "Wetland" }, and watershed and stream processes.

According to the Glen Canyon GzMP{ XE "Grazing Management Plan, Glen Canyon (GzMP 1999)" } (NPS 1999), Glen Canyon was established "…to provide for public outdoor recreation use and enjoyment of Lake Powell and lands adjacent thereto…and to protect and preserve the scenic, scientific and historic resources…" Water resources in Glen Canyon are essential to support complex and diverse biological communities, riparian vegetation, and fish and wildlife, which are often isolated by vast expanses of desert. Maintaining high water quality and instream flows are management priorities for sustainability of water and water-dependent resources. The goal is to maintain water quality in all natural bodies of water and sources of water[10] and maintain natural flows to preserve water dependent resources. At a minimum, water quality standards will meet Utah's water requirements. The six water quality objectives address water

[10] Does not include stock ponds or reservoirs

quality and quantity, aquatic species, stream conditions, aesthetic value of natural water, and access to water.

3.4.1 Current Conditions

Surface Water Sources

Although water shaped much of the terrain of the planning area, there are limited sources of surface water. All the surface water in this region flows into the Colorado River (whether above or below Glen Canyon Dam).

The Escalante River system, the main stem and many tributaries of which are perennial{ XE "Perennial" }, flows from the Aquarius Plateau into the upper portions of Lake Powell. Above the town of Escalante, most of the river's flow is diverted seasonally to Wide Hollow Reservoir for irrigation.

Last Chance Creek and Wahweap Creek are the primary tributaries coming off the Kaiparowits Plateau, flowing into the main body of Lake Powell. Wahweap Creek and Last Chance Creek are perennial{ XE "Perennial" } only along portions of their length.

The Paria River sub-basin (including Hackberry Creek and Cottonwood Creek) extends from the Bryce Canyon-Bryce Valley area, terminating below Glen Canyon Dam near Lee's Ferry. The Paria River Sub-basin is perennial{ XE "Perennial" } from below the town of Cannonville downstream to below the confluence of Cottonwood Creek, and then flows intermittently on its way to the Colorado River. The upper reaches of the Paria River are intermittent and often are diverted for irrigation in the Tropic/Cannonville area. On the west side of the planning area, the Kanab Creek sub-basin (including Johnson Wash and its tributaries) drains into the Colorado River in the Grand Canyon.

There are approximately 8,285 miles of streams and washes in the decision area (BLM GIS 2014). Approximately 96 percent of these are intermittent or ephemeral{ XE "Ephemeral" }. Figure 3-7~~Figure 3-7~~, Surface Water, shows the locations of surface water sources in the

Groundwater Sources

The Colorado Plateau aquifers underlie the planning area (Robson and Banta 1995) in an area of approximately 110,000 square miles in western Colorado, northwestern New Mexico, northeastern Arizona, and eastern Utah. In general, these aquifers are composed of permeable, moderately to well-consolidated sedimentary rocks. Much of the land in this region is underlain by rocks that contain aquifers capable of yielding usable quantities of water suitable for agricultural or domestic use. Groundwater quantity and quality in the Colorado Plateau aquifers are extremely variable.

The major aquifer system underlying the planning area is within the Navajo Sandstone and underlying sandstones that exist in most parts of GSENM. This system is part of a regional aquifer system that encompasses parts of Colorado, Arizona, and Utah and is now called the Glen Canyon Aquifer. This aquifer is recharged partly by precipitation that infiltrates the Navajo Sandstone, where it crops out in the northeastern and southwestern parts of GSENM; it is also partly recharged by snowmelt and rainfall that infiltrate the higher plateaus to the north and the

Kaiparowits Plateau, where the water must move down through overlying strata before it reaches the Glen Canyon Aquifer. This aquifer sustains part of the base flow in Johnson Creek, the Paria River, and the Escalante River and its tributaries (Freethey 1997).

FOIA001:01673156

Figure 3-7 Surface Water

Other regional aquifers exist under GSENM. The Kaiparowits Plateau includes the Mesa Verde, the Dakota, the Morrison, and the Entrada-Preuss Aquifers that overlie the Glen Canyon Aquifer. Carbonate aquifers of Paleozoic age underlie all of GSENM but are largely inaccessible because of their depth. Direction of groundwater movement, estimated from water levels from a few wells and from knowledge about the nature of recharge to aquifers, is from the northwest to the southeast, toward Lake Powell. From meager data, local groundwater is thought to move toward and discharge into the deepest canyons. The thickness of these regional aquifers ranges from 200 feet for the Dakota Aquifer to 2,200 feet for the Glen Canyon Aquifer (Freethey 1997).

Water Quality

Every other year, the Utah Department of Environmental Quality (DEQ), Division of Water Quality, compiles all readily available data and analyzes it to determine whether water quality is sufficient to meet the beneficial uses assigned to waters in Utah (DEQ 2014). Beneficial uses are identified by taking into consideration the use and value of the water body for public water supply, for protecting fish, shellfish, and wildlife, and for recreational, agricultural, industrial, and navigational purposes.

The Clean Water Act's 303(d) List is a list of impaired waters that fail to meet water quality standards or are biologically impaired. Table 3-10~~Table 3-10~~, 2010, 2014 303(d) list: Category 5 (Need TMDL), and Table 3-11~~Table 3-11~~, 2010, 2014 303(d) list: Assessment (Insufficient Data, Exceedances), identify the waters in the decision area that are on the 303(d) List and their reason for being on it. Category 5 parameters are those for which the assessment unit is impaired; Category 3 parameters are those for which there has been one or more exceedance of water quality standards at one or more monitoring sites in the assessment unit. Figure 3-7~~Figure 3-7~~, Surface Water. shows the locations of the waters in the decision area the 303(d) List.

There are number of assessment units (see Table 3-11~~Table 3-11~~, 2010, 2014 303(d) list: Category 3 (Insufficient Data, Exceedances)) that could not be assessed because of insufficient data. Table 3-12~~Table 3-12~~, Exceedances at Water Quality Monitoring Sites in Category 3 Units, lists parameters for which water quality standards were exceeded at least once between 1970 and August 2014. It identifies in the parameters column water quality standard exceedances according to the Utah Division of Water Quality database from 1970 to August 2014. This highlights the potential water quality concerns for the assessment units that could not be assessed because of insufficient data, and it suggests where additional monitoring is needed.

Table 3-10
2010, 2014 303(d) list: Assessment Unit Category 5 (Need TMDL)

303(d) Year	Assessment Unit ID	Assessment Unit Description	Assessment Unit Location	Assessment Unit Uses[1]	Stream Miles	Parameters, TMDL Priority (Low or Medium)
2014	UT14070005-001	Upper Valley Creek	Upper Valley Creek and tributaries, from confluence with Birch Creek to headwaters	2B 4 3A HH3A	0.17	Dissolved oxygen (low), temperature (low)
2014	UT14070005-002	Birch Creek	Birch Creek and tributaries, from confluence with Escalante River to headwaters	2B 4 3A HH3A	30.0	Temperature (low)
2014	UT14070005-003	North Creek	North Creek and tributaries, from confluence with Escalante River to headwaters	2B 4 3A HH3A	49.8	Dissolved oxygen (low), temperature (low)
2010, 2014	UT14070005-007	Calf Creek	Calf Creek and tributaries, from confluence with Escalante River to headwaters	3A HH3A	8.1	Temperature (low)
2010, 2014	UT14070005-012	Escalante River Upper	Upper Valley Creek and tributaries, from confluence with Birch Creek to headwaters	2B 4 3B HH3B	28.1	OE bio assessment (low)
2014	UT14070006-001	Wahweap Creek	Wahweap Creek and tributaries, from Lake Powell to headwaters	2B 4 3A HH3B	0.1	Selenium (low), temperature (low), total dissolved solids (low)
2010	UT14070006-004	(Last)[2] Chance Creek	(Last)[2] Chance Creek and tributaries, from Lake Powell to headwaters	Cold water aquatic life	16.7	Benthic macroinvertebrate bio assessments (low)
2014	UT14070006-004	(Last)[2] Chance Creek	(Last)[2] Chance Creek and tributaries, from Lake Powell to headwaters	2B 4 3A HH3B	16.7	OE bio assessment (low), total dissolved solids (low)

Table 3-10
2010, 2014 303(d) list: Assessment Unit Category 5 (Need TMDL)

303(d) Year	Assessment Unit ID	Assessment Unit Description	Assessment Unit Location	Assessment Unit Uses[1]	Stream Miles	Parameters, TMDL Priority (Low or Medium)
2010	UT14070007-001	Paria River-1	Paria River, from start of Paria River Gorge to headwaters	Nongame fish and other aquatic life, agricultural	16.8	Benthic macroinvertebrate bio assessments (low), temperature (low), Total dissolved solids (medium)
2014	UT14070007-001	Paria River-1	Paria River, from start of Paria River Gorge to headwaters	2B 4 3C HH3C	31.5	Total dissolved solids (medium)
2014	UT14070007-002	Paria River-2	Paria River, from Cottonwood Creek confluence to start of Paria River Gorge	2B 4 3C HH3C	52.4	Temperature (low), total dissolved solids (medium)
2014	UT14070007-004	Cottonwood Creek	Cottonwood Creek and tributaries, from confluence with Paria River to headwaters	2B 4 3C HH3C	6.3	Dissolved oxygen (low)
2010	UT14070007-005	Paria River-3	Paria River and tributaries, from Arizona-Utah state line to Cottonwood Creek confluence	Nongame fish and other aquatic life	9.2	Benthic macroinvertebrate bio assessments (low)
2014	UT14070007-005	Paria River-3	Paria River and tributaries, from Arizona-Utah state line to Cottonwood Creek confluence	2B 4 3C HH3C	11.0	OE bio assessment (low), total dissolved solids (medium)
2010	UT15010003-002	Kanab Creek-1	Kanab Creek and tributaries, from state line to the confluence with Fourmile Hollow near the White Cliffs	Agricultural	17.6	Total dissolved solids (low)

Table 3-10
2010, 2014 303(d) list: Assessment Unit Category 5 (Need TMDL)

303(d) Year	Assessment Unit ID	Assessment Unit Description	Assessment Unit Location	Assessment Unit Uses[1]	Stream Miles	Parameters, TMDL Priority (Low or Medium)
2014	UT15010003-002	Kanab Creek-1	Kanab Creek and tributaries, from state line to the confluence with Fourmile Hollow near the White Cliffs	2B 4 3C HH3C	18.0	Dissolved oxygen (low)
2014	UT15010003-003	Kanab Creek-2	Kanab Creek and tributaries, from the confluence with Fourmile Hollow near the White Cliffs to Reservoir Canyon	2B 4 3C HH3C	8.1	Boron (medium), cadmium (low), lead (low), total dissolved solids (medium)
2010	UT15010003-004	Johnson Wash-1	Johnson Wash and tributaries, from Utah-Arizona state line to Skutumpah Canyon confluence	Agriculture	12.0	Total dissolved solids (low)
2014	UT15010003-004	Johnson Wash-1	Johnson Wash and tributaries, from Utah-Arizona state line to Skutumpah Canyon confluence	2B 4 3C HH3C	22.1	Boron (medium), selenium (medium), temperature (medium)
2014	UT15010003-005	Johnson Wash-2	Johnson Wash and tributaries, from (including) Skutumpah Canyon to headwaters	2B 4 3A HH3A	27.2	Copper (medium), dissolved oxygen (medium), lead (medium), temperature (medium), total dissolved solids (medium), zinc (medium)

Source: Utah Division of Water Quality 2010, 2014
[1] Use designations defined by Utah Standards of Quality for Waters of the State (Utah Administrative Code Rules R317-2-6 and R-317-2-13)
[2] Utah DWQ refers to this as Chance Creek. Local maps refer to it as Last Chance Creek.

Table 3-11
2010, 2014 303(d) list: Assessment Unit Category 3 (Insufficient Data, Exceedances)

303(d) Year	Assessment Unit ID	Assessment Unit Description	Assessment Unit Location	Assessment Unit Uses	Stream Miles	Parameters
2014	UT14070005-004	Pine Creek	Pine Creek and tributaries, from confluence with Escalante River to headwaters	2B 4 3A HH3A	33.5	Not stated
2010	UT14070005-013	Escalante tributaries	Escalante tributaries not previously defined, from Boulder Creek to Birch Creek	2B 4 3A HH3A	0.01 (?)	Not stated
2010	UT14070005-014	Alvey Wash Upper	Alvey Wash and tributaries, from Tenmile Spring{ XE "Spring" } to headwaters	2B 4 #B HH3B	0.01 (?)	Not stated
2010	UT14070005-015	Alvey Wash Lower	Harris Wash and tributaries, from confluence with Escalante River to Tenmile Spring{ XE "Spring" }	2B 4 3B HH3B	8.9	Not stated
2010	UT14070005-016	Wolverine Creek	Wolverine Creek and tributaries, from confluence with Escalante River to headwaters	2B 4 3B HH3B	0.01 (?)	Not stated
2014	UT14070005-017	Coyote Gulch	Coyote Gulch and tributaries, from confluence with Escalante River to headwaters	2B 4 3B HH3B	13.3	Not stated
2014	UT14070005-018	Boulder Creek	Boulder Creek and tributaries, from confluence with Escalante River to headwaters	2B 4 3A HH3A	58.6	Not stated

Table 3-11
2010, 2014 303(d) list: Assessment Unit Category 3 (Insufficient Data, Exceedances)

303(d) Year	Assessment Unit ID	Assessment Unit Description	Assessment Unit Location	Assessment Unit Uses	Stream Miles	Parameters
2012	UT14070006-002	Warm Creek	Warm Creek and tributaries, from Lake Powell to headwaters	2B 4 3B HH3B	2.5	Not stated
2010	UT14070006-003	Lake Powell tributaries-1	Lake Powell north side tributaries, between Wahweap and Warm Creek	No record of uses	0.01 (?)	Not stated
2012	UT14070006-005	Croton	Croton Canyon and tributaries, from Lake Powell to headwaters	2B 4 3B HH3B	2.4	Not stated
2012	UT14070006-006	Lake Powell tributaries-3	Lake Powell tributaries, from Croton Canyon to HUC boundary	2B 4 3B HH3B	Non-perennial { XE "Perennial" }	Not stated
2010	UT14070006-008	Lake Powell tributaries-2	Lake Powell north side tributaries, between Warm and (Last)[1] Chance Creeks	No record of uses	0.01 (?)	Not stated
2012	UT14070001-006	Navajo Long Creek		2B 4 3B HH3B	Non-perennial { XE "Perennial" }	Not stated
2012	UT14070005-005	Mamie Creek	Mamie Creek and tributaries, from confluence with Escalante River to headwaters	2B 4 3A HH3A	Non-perennial { XE "Perennial" }	Not stated
2012	UT14070005-019	Lower Escalante tributaries		2B 4 3B HH3B	Non-perennial { XE "Perennial" }	Not stated

Table 3-11
2010, 2014 303(d) list: Assessment Unit Category 3 (Insufficient Data, Exceedances)

303(d) Year	Assessment Unit ID	Assessment Unit Description	Assessment Unit Location	Assessment Unit Uses	Stream Miles	Parameters
2010	UT15010003-006	Kanab Creek-3	Kanab Creek and tributaries, from Reservoir Canyon to headwaters	No record of uses	0.03	

Source: Utah Division of Water Quality 2014
[1] Utah DWQ refers to this as Chance Creek; local maps refer to it as Last Chance Creek.

In some cases, livestock grazing may contribute to water quality impairment, whether by direct effects, such as those of animal waste on dissolved oxygen or nutrients (nitrogen or phosphorus), or by indirect effects, such as by increasing erosion, which increases sediment loading (turbidity), total dissolved solids, and associated metals. Such effects may also impair benthic macroinvertebrate and fish habitat and result in low observed/expected bioassessments. Also, water quality impaired by animal waste can affect individuals participating in recreation, such as swimming, and sources of safe drinking water.

The following livestock grazing allotments contain waters in the decision area that are on the 303(d) List (BLM GIS 2014; Utah Division of Water Quality GIS 2015):

Bunting Trust	Cottonwood	First Point
Flood Canyon	Granary Ranch	Hall Ranch
Haymaker Bench	Headwaters	Hells Bellows
Johnson Canyon	Last Chance	Main Canyon
Mollies Nipple	Phipps	Second Point
Upper Paria	Varney Griffin	Wide Hollow
Willow Gulch		

These allotments are on BLM-managed lands only, except for Last Chance, which is on both BLM- and NPS-managed lands. A variety of factors affect the listing of waters on the 303(d) list. The rangeland health{ XE "Rangeland Health" } standards discussion below identifies which livestock grazing allotments in the decision area do not meet Standard 4 (water quality standards) due to livestock grazing.

Tables 3-11 and **3-12** both show that many water quality exceedances in the planning area are for temperature. Existing water quality management plans for the Escalante River and Paria River watersheds address mainly temperature or total dissolved solids (Millennium Science & Engineering, Inc., undated[a] and undated[b]). Water temperature can still be altered even if it is not severe enough to create impaired waters that fail to meet water quality standards. The BLM has worked with permittees to gradually reduce the potential contribution of livestock grazing

to exceedances. It made allotments unavailable along the main stem Escalante River, in Sand and Death Hollow watersheds in 1999, primarily to reduce livestock/recreationist conflicts. The closures also benefited riparian and upland vegetation, water quality, and wildlife that depend on available forage. The BLM has implemented projects since adopting the plan to restore altered watersheds and improve conditions (Millennium Science & Engineering, Inc., undated[a]).

Various public organizations and government entities conduct measures to control woody invasive plants{ XE "Invasive Species" }, which has water quality benefits. This work, principally on Russian olive, has been conducted in the Escalante watershed. In addition, tamarisk has been removed. Woody invasive plants are removed and replaced with native species through passive or active revegetation; this provides nonpoint source reduction through both bank stabilization and restoration and enhancement of the riparian community and associated hydrologic, sediment trapping, and biogeochemical processes (DEQ 2013; Woody Invasive Control Committee 2010).

Table 3-12
Exceedances at Water Quality Monitoring Sites in Category 3 Assessment Units

AU ID	AU Name	AU Description	STORET	Site Name	Parameters
UT14070005-001	Upper Valley Creek	Upper Valley Creek and tributaries, from confluence with Birch Creek to headwaters	4953980	Upper Valley Creek above confluence with North Creek	Dissolved oxygen, temperature
UT14070005-007	Calf Creek	Calf Creek and tributaries, from confluence with Escalante River to headwaters	4954210	Calf Creek above confluence with Escalante River	Temperature
UT14070005-002	Birch Creek	Birch Creek and tributaries, from confluence with Escalante River to headwaters	4953978	Birch Creek above confluence with North Creek	Temperature
UT14070005-003	North Creek	North Creek and tributaries, from confluence with Escalante River to headwaters	4954630	North Creek above confluence with Escalante River	Dissolved oxygen, temperature
UT14070005-007	Calf Creek	Calf Creek and tributaries, from confluence with Escalante River to headwaters	4954260	Calf Creek above campground	Temperature
UT14070005-007	Calf Creek	Calf Creek and tributaries, from confluence with Escalante River to headwaters	5994060	Calf Creek above Upper Falls	Temperature
UT14070005-007	Calf Creek	Calf Creek and tributaries, from confluence with Escalante River to headwaters	5994070	Calf Creek below Lower Falls	Temperature
UT14070005-002	Birch Creek	Birch Creek and tributaries, from confluence with Escalante River to headwaters	4953940	Birch Creek at Point of Diversion	Temperature
UT14070005-002	Birch Creek	Birch Creek and tributaries, from confluence with Escalante River to headwaters	4953942	Birch Creek below Confluence with Corn Creek	Temperature
UT14070005-003	North Creek	North Creek and tributaries, from confluence with Escalante River to headwaters	4954625	North Creek approximately 4.7 miles above Confluence with Escalante River	Dissolved oxygen, temperature

Table 3-12
Exceedances at Water Quality Monitoring Sites in Category 3 Assessment Units

AU ID	AU Name	AU Description	STORET	Site Name	Parameters
UT14070005-003	North Creek	North Creek and tributaries, from confluence with Escalante River to headwaters	4955070	North Creek below Confluence with East Fork North Creek at Forest Service Road 149 Crossing	Dissolved oxygen, temperature
UT14070005-016	Wolverine Creek	Wolverine Creek and tributaries, from confluence with Escalante River to headwaters	5994140	Brinkerhoff Spring{ XE "Spring" } east of Lampstand	Total P, pH, Se, dissolved oxygen
UT14070005-014	Alvey Wash Upper	Alvey Wash and tributaries, from Tenmile Spring{ XE "Spring" } to headwaters	5994160	Alvey Wash at 10 Mile Crossing	Dissolved oxygen, total dissolved solids
UT14070005-017	Coyote Gulch	Coyote Gulch and tributaries, from confluence with Escalante River to headwaters	5994250	Willow Tank Spring{ XE "Spring" }	Dissolved oxygen
UT14070005-016	Wolverine Creek	Wolverine Creek and tributaries, from confluence with Escalante River to headwaters	5994090	Stair Canyon Spring{ XE "Spring" } (The Gulch Headwaters Forest Service)	Dissolved oxygen
UT14070005-014	Alvey Wash Upper	Alvey Wash and tributaries, from Tenmile Spring{ XE "Spring" } to headwaters	5994180	Big Horn Spring{ XE "Spring" } at Big Flat	pH, dissolved oxygen
UT14070005-018	Boulder Creek	Boulder Creek and tributaries, from confluence with Escalante River to headwaters	5994080	Boulder Creek above confluence with Escalante River	Dissolved oxygen
UT14070005-015	Alvey Wash Lower	Harris Wash and tributaries, from confluence with Escalante River to Tenmile Spring{ XE "Spring" }	5994190	Harris Wash above confluence with Escalante River	Dissolved oxygen
UT14070005-015	Alvey Wash Lower	Harris Wash and tributaries, from confluence with Escalante River to Tenmile Spring{ XE "Spring" }	5994200	Harris Wash at Glen Canyon fence	Total P, dissolved oxygen
UT14070005-017	Coyote Gulch	Coyote Gulch and tributaries, from confluence with Escalante River to headwaters	5994230	Coyote Gulch above Escalante River	Total P, dissolved oxygen

Table 3-12
Exceedances at Water Quality Monitoring Sites in Category 3 Assessment Units

AU ID	AU Name	AU Description	STORET	Site Name	Parameters
UT14070005-017	Coyote Gulch	Coyote Gulch and tributaries, from confluence with Escalante River to headwaters	5994235	Coyote Gulch at Jacob Hamblin Arch (UT09ST-251)	pH
UT14070005-017	Coyote Gulch	Coyote Gulch and tributaries from confluence with Escalante River to headwaters	5994240	Coyote Gulch at Glen Canyon fence	pH, dissolved oxygen, total dissolved solids
UT14070005-005	Mamie Creek	Mamie Creek and tributaries, from confluence with Escalante River to headwaters	5994040	Death Hollow above confluence with Escalante River	pH, dissolved oxygen, total dissolved solids
UT14070005-008	Deer Creek-Escalante	Deer Creek and tributaries, from confluence with Escalante River to headwaters	4954080	Deer Creek at Burr Trail crossing east of Boulder	Total P, pH
UT14070005-008	Deer Creek-Escalante	Deer Creek and tributaries, from confluence with Escalante River to headwaters	4954085	Deer Creek approximately 0.3 miles above Burr Trail crossing (UT09ST-231)	No exceedances
UT14070005-010	The Gulch	The Gulch from confluence with Escalante River to headwaters	4954100	The Gulch Creek in Long Canyon at Burr Trail crossing	pH, total P, dissolved oxygen, Al
UT14070005-012	Escalante River Upper	Upper Valley Creek and tributaries, from confluence with Birch Creek to headwaters	4954200	Escalante River below confluence with Calf Creek	OE bioassessment
UT14070005-012	Escalante River Upper	Upper Valley Creek and tributaries, from confluence with Birch Creek to headwaters	4954240	Escalante River above Confluence with Calf Creek	OE bioassessment
UT14070005-012	Escalante River Upper	Upper Valley Creek and tributaries, from confluence with Birch Creek to headwaters	4954635	Escalante River at head below Confluence with Birch Creek and North Creek	OE bioassessment
UT14070005-012	Escalante River Upper	Upper Valley Creek and tributaries, from confluence with Birch Creek to headwaters	4954650	Escalante River northeast of Escalante at R Ford	OE bioassessment

Table 3-12
Exceedances at Water Quality Monitoring Sites in Category 3 Assessment Units

AU ID	AU Name	AU Description	STORET	Site Name	Parameters
UT14070005-012	Escalante River Upper	Upper Valley Creek and tributaries, from confluence with Birch Creek to headwaters	4954660	Escalante River 3.5 miles west of town at weir gage	OE bioassessment
UT14070005-013	Escalante tributaries	Escalante tributaries not previously defined from Boulder Creek to Birch Creek	5953850	Unnamed stream below Wide Hollow Reservoir	Total P
UT14070005-014	Alvey Wash Upper	Alvey Wash and tributaries, from Tenmile Spring{ XE "Spring" } to headwaters	5994170	Alvey Wash at Little Valley crossing	No exceedances
undefined	undefined	Escalante tributaries at Lake Powell	5994260	Forty Mile Spring{ XE "Spring" }	Dissolved oxygen, Fe, Se, total dissolved solids
undefined	Twentymile Wash	Twenty-TwentyFive Mile Wash from confluence with Escalante River to headwaters	5994310	Hardhead Spring{ XE "Spring" }	Total pH, dissolved oxygen, Se, total dissolved solids, Zn
UT14070005-016	Wolverine Creek	Wolverine Creek and tributaries, from confluence with Escalante River to headwaters	5994400	Horse Canyon Spring{ XE "Spring" }	No exceedances
UT14070005-011	Escalante River Lower	Escalante River from Lake Powell to Boulder Creek confluence	4954196	Escalante River below Scorpion Gulch (emap)	No exceedances
UT14070005-012	Escalante River Upper	Upper Valley Creek and tributaries, from confluence with Birch Creek to headwaters	4954640	Escalante River below confluence with Pine Creek	OE bioassessment
Undefined	Undefined	Escalante tributaries at Lake Powell	5952700	Lake Powell off Davis Gulch	Dissolved oxygen, Hg
Undefined	Undefined	Escalante tributaries at Lake Powell	5952720	Lake Powell Escalante arm half-way up channel	Dissolved oxygen
UT14070005-011	Escalante River Lower	Escalante River from Lake Powell to Boulder Creek confluence	5952730	Lake Powell Escalante arm 328 feet (100 meters) from end of water	Total P, dissolved oxygen
UT14070005-011	Escalante River Lower	Escalante River from Lake Powell to Boulder Creek confluence	5952740	Escalante River above Lake Powell	Al, Cd, Cu, dissolved oxygen, Fe, Pb, total P

Table 3-12
Exceedances at Water Quality Monitoring Sites in Category 3 Assessment Units

AU ID	AU Name	AU Description	STORET	Site Name	Parameters
UT14070005-006	Sand Creek	Sand Creek and tributaries, from confluence with Escalante River to headwaters	5994000	Sand Creek above confluence with Escalante River	Total P, dissolved oxygen
UT14070005-006	Sand Creek	Sand Creek and tributaries, from confluence with Escalante River to headwaters	5994002	Sand Creek 2 miles above Escalante River	No exceedances
UT14070005-006	Sand Creek	Sand Creek and tributaries, from confluence with Escalante River to headwaters	5994005	Sand Creek approximately 6 miles above confluence with Escalante River (UT09ST-220)	Total P
UT14070005-006	Sand Creek	Sand Creek and tributaries, from confluence with Escalante River to headwaters	5994007	Sand Creek approximately 9 miles above confluence with Escalante River (UT09ST-204)	No exceedances
UT14070005-010	The Gulch	The Gulch from confluence with Escalante River to headwaters	5994050	The Gulch above confluence with Steep Creek	Dissolved oxygen
UT14070005-010	The Gulch	The Gulch from confluence with Escalante River to headwaters	5994110	The Gulch above confluence with Escalante River	No exceedances
UT14070005-016	Wolverine Creek	Wolverine Creek and tributaries, from confluence with Escalante River to headwaters	5994120	Horse Canyon above confluence with Escalante River	No exceedances
UT14070005-011	Escalante River Lower	Escalante River from Lake Powell to Boulder Creek confluence	5994210	Escalante River above confluence with Harris Wash	Dissolved oxygen
Undefined	Undefined	Escalante tributaries at Lake Powell	5994220	Forty Mile Gulch above waterfall	Dissolved oxygen
UT14070005-010	The Gulch	The Gulch from confluence with Escalante River to headwaters	5994390	The Gulch at Roundy Cabin	Dissolved oxygen
UT14070005-004	Pine Creek	Pine Creek and tributaries, from confluence with Escalante River to headwaters		None on GSENM--near 4954640 (Escalante River below confluence with Pine Creek)	

Table 3-12
Exceedances at Water Quality Monitoring Sites in Category 3 Assessment Units

AU ID	AU Name	AU Description	STORET	Site Name	Parameters
UT14070005-005	Mamie Creek	Mamie Creek and tributaries, from confluence with Escalante River to headwaters	5994042	Mamie Creek 3 miles above Escalante River	No exceedances
UT14070005-019	Lower Escalante tributaries			None on GSENM	
UT14070007-005	Paria River-3	Paria River and tributaries, from Arizona-Utah state line to Cottonwood Creek confluence	4951850	Paria River at US-89 crossing	OE/benthic macroinvertebrate bioassessment, total dissolved solids
UT14070007-001	Paria River-1	Paria River from start of Paria River Gorge to headwaters	4951860	Paria River at Kodachrome Basin Road crossing	Benthic macroinvertebrate bioassessments, temperature, total dissolved solids
UT14070007-001	Paria River-1	Paria River from start of Paria River Gorge to headwaters	4951870	Paria River at U-12 crossing	Benthic macroinvertebrate bioassessments, temperature, total dissolved solids
UT14070007-001	Paria River-1	Paria River from start of Paria River Gorge to headwaters	4951890	Henrieville Wash 3 miles east of Cannonville	Benthic macroinvertebrate bioassessments, temperature, total dissolved solids
UT14070007-001	Paria River-1	Paria River from start of Paria River Gorge to headwaters	4951900	Henrieville Wash at U-12 crossing 8 miles east of Cannonville	Benthic macroinvertebrate bioassessments, temperature, total dissolved solids

Table 3-12
Exceedances at Water Quality Monitoring Sites in Category 3 Assessment Units

AU ID	AU Name	AU Description	STORET	Site Name	Parameters
UT14070006-001	Wahweap Creek	Wahweap Creek and tributaries, from Lake Powell to headwaters	5994527	Wahweap Creek below Big Water town at road crossing to Wiregrass Spring{ XE "Spring" }	Temperature, total dissolved solids
UT14070006-001	Wahweap Creek	Wahweap Creek and tributaries, from Lake Powell to headwaters	5994530	Wahweap Creek at Warm Creek Road crossing	Temperature, total dissolved solids
UT14070006-001	Wahweap Creek	Wahweap Creek and tributaries, from Lake Powell to headwaters	5994531	Wahweap Creek below Wahweap Creek Fish Hatchery	Temperature, total dissolved solids
UT14070006-001	Wahweap Creek	Wahweap Creek and tributaries, from Lake Powell to headwaters	5994533	Wahweap Creek above Wahweap Fish Hatchery at Monument Boundary	Temperature, total dissolved solids
UT14070006-004	(Last) Chance Creek	(Last) Chance Creek and tributaries, from Lake Powell to headwaters	5994330	Last Chance Creek at Smokey Mountain Road crossing	OE/benthic macroinvertebrate bioassessment, total dissolved solids
UT14070007-002	Paria River-2	Paria River from Cottonwood Creek confluence to start of Paria River Gorge	5994340	Sheep Creek at Skutumpah Road crossing	Temperature, total dissolved solids
UT14070007-002	Paria River-2	Paria River from Cottonwood Creek confluence to start of Paria River Gorge	5994350	Willis Creek at Skutumpah Road crossing	Temperature, total dissolved solids
UT14070006-004	(Last) Chance Creek	(Last) Chance Creek and tributaries, from Lake Powell to headwaters	5994360	Drip Tank Canyon Flowing Well	OE/benthic macroinvertebrate bioassessment, total dissolved solids
UT14070006-004	(Last) Chance Creek	(Last) Chance Creek and tributaries, from Lake Powell to headwaters	5994520	Last Chance at Burning Hills Road crossing	OE/benthic macroinvertebrate bioassessment, total dissolved solids

Table 3-12
Exceedances at Water Quality Monitoring Sites in Category 3 Assessment Units

AU ID	AU Name	AU Description	STORET	Site Name	Parameters
UT14070007-004	Cottonwood Creek	Cottonwood Creek and tributaries, from confluence with Paria River to headwaters	5994540	Hackberry Canyon above confluence with Cottonwood Creek	Dissolved oxygen
UT14070006-001	Wahweap Creek	Wahweap Creek and tributaries, from Lake Powell to headwaters	5994570	Lower Coyote Canyon Spring{ XE "Spring" }	Temperature, total dissolved solids
UT15010003-004	Johnson Wash-1	Johnson Wash and tributaries, from Utah-Arizona state line to Skutumpah Canyon confluence	5994590	Seaman Wash Distribution System	Total dissolved solids, temperature
UT15010003-005	Johnson Wash-2	Johnson Wash and tributaries, from (including) Skutumpah Canyon to headwaters	5994788	Thompson Creek at County Road above Skutumpah	Dissolved oxygen temperature, total dissolved solids
UT15010003-002	Kanab Creek-1	Kanab Creek and tributaries, from state line to the confluence with Fourmile Hollow near the White Cliffs		None on GSENM (headwaters Brown Canyon only)	Total dissolved solids, dissolved oxygen
UT14070007-002	Paria River-2	Paria River from Cottonwood Creek confluence to start of Paria River Gorge	5994550	Paria River at Old Town Site	Temperature, total dissolved solids
UT14070007-004	Cottonwood Creek	Cottonwood Creek and tributaries, from confluence with Paria River to headwaters	5994710	Cottonwood Creek above confluence with Hackberry Canyon	Dissolved oxygen
UT15010003-004	Johnson Wash-1	Johnson Wash and tributaries, from Utah-Arizona state line to Skutumpah Canyon confluence	5994720	Glass Eyed Spring{ XE "Spring" }	Total dissolved solids, temperature
UT15010003-004	Johnson Wash-1	Johnson Wash and tributaries, from Utah-Arizona state line to Skutumpah Canyon confluence	5994420	Neaf Spring{ XE "Spring" }	Total dissolved solids, temperature
UT15010003-004	Johnson Wash-1	Johnson Wash and tributaries, from Utah-Arizona state line to Skutumpah Canyon confluence	5994600	Pink Cove Catchment	Total dissolved solids, temperature

Table 3-12
Exceedances at Water Quality Monitoring Sites in Category 3 Assessment Units

AU ID	AU Name	AU Description	STORET	Site Name	Parameters
UT14070007-002	Paria River-2	Paria River from Cottonwood Creek confluence to start of Paria River Gorge	5994545	Paria River above confluence with Cottonwood Creek	Temperature, total dissolved solids
UT15010003-003	Kanab Creek-2	Kanab Creek and tributaries, from the confluence with Fourmile Hollow near the White Cliffs to Reservoir Canyon		None on GSENM (headwater Utah Kanab Creek only)	Total dissolved solids
UT14070006-005	Croton	Croton Canyon and tributaries, from Lake Powell to headwaters	5994510	Croton Canyon 1/3 mile below Grand Bench Road crossing	Total P, Al, Cd, dissolved oxygen, Fe, Pb, Se, total dissolved solids
UT14070006-002	Warm Creek	Warm Creek and tributaries, from Lake Powell to headwaters	5994560	Tibbet Canyon 2 miles above confluence with Warm Creek	pH, total P, dissolved oxygen, Fe, total dissolved solids
UT14070006-006	Lake Powell tributaries-3	Lake Powell tributaries, from Croton Canyon to HUC boundary	5994630	Little Valley Wash at Grand Bench Road crossing	Total P, Al, total dissolved solids
UT14070006-002	Warm Creek	Warm Creek and tributaries, from Lake Powell to headwaters	5994580	Wesses Canyon at Cow Camp	Total P, dissolved oxygen
UT14070006-006	Lake Powell tributaries-3	Lake Powell tributaries, from Croton Canyon to HUC boundary	5994270	Lake Spring{ XE "Spring" } below Horse Pasture	Total P, dissolved oxygen
UT14070006-006	Lake Powell tributaries-3	Lake Powell tributaries, from Croton Canyon to HUC boundary	5994280	Lake Spring{ XE "Spring" } at cabin	Total P, Cd, dissolved oxygen
UT14070006-006	Lake Powell tributaries-3	Lake Powell tributaries, from Croton Canyon to HUC boundary	5994290	Maple Seep Spring{ XE "Spring" }	Dissolved oxygen
UT14070006-005	Croton	Croton Canyon and tributaries, from Lake Powell to headwaters	5994750	Little Valley Spring{ XE "Spring" }	Dissolved oxygen, total dissolved solids
UT14070007-003	Buckskin Gulch	Buckskin Gulch and tributaries, from Paria River confluence to headwaters	5994610	Nephi Wash Spring{ XE "Spring" } development	Total P, Fe, dissolved oxygen, Cu, Al, total dissolved solids
UT14070007-003	Buckskin Gulch	Buckskin Gulch and tributaries, from Paria River confluence to headwaters	5994650	Deer Spring{ XE "Spring" } Wash below Deer Spring Ranch	pH, total P, dissolved oxygen, total dissolved solids

Table 3-12
Exceedances at Water Quality Monitoring Sites in Category 3 Assessment Units

AU ID	AU Name	AU Description	STORET	Site Name	Parameters
UT14070006-005	Croton	Croton Canyon and tributaries, from Lake Powell to headwaters	5994320	Circle Spring{ XE "Spring" }	Zn
UT14070001-006	Navajo Long Creek	Navajo Long Canyon and tributaries, from Lake Powell to headwaters		Navajo Creek	
UT14070006-003	Lake Powell tributaries-1	Lake Powell north side tributaries between Wahweap and Warm Creek		None on GSENM or Glen Canyon	
UT14070006-008	Lake Powell tributaries-2	Lake Powell north side tributaries between Warm and (Last) Chance Creeks		Lake Powell Tributaries-2	

Source: Kevin Miller, BLM, personal communication with Derek Holmgren, EMPSi, October 2, 2015

Rangeland Health{ XE "Rangeland Health" } Standards

The BLM Utah developed *Standards for Rangeland Health{ XE* "Rangeland Health" } *and Guidelines for Grazing Management*, in accordance with 43 CFR, Part 4180, to conform with the Fundamentals of Rangeland Health. Through conformance and attainment of Utah's Standards and Guidelines, BLM Utah ensures that the Fundamentals of Rangeland Health are met. According to Standard 4, the BLM Utah and GSENM will apply and comply with water quality standards established by the State of Utah (R.3172) and the Federal Clean Water and Safe Drinking Water Acts (BLM 1997). See **Section 3.1**, Livestock Grazing, for Standard 4 indicators. The BLM ensures that grazing in Glen Canyon complies with the respective Utah and Arizona Standards for Rangeland Health and Guidelines for Grazing Management (NPS 1999, p. 10).

The BLM coordinates water quality monitoring with other federal, and state agencies. Livestock grazing allotments in the decision area that do not meet Standard 4 due to livestock grazing are Rock Creek-Mudholes and Vermilion. Grazing was a contributing factor{ XE "Contributing Factor" }, but not the sole causal factor{ XE "Causal Factor" }, for Standard 4 not being met in the Headwaters, Last Chance, and Nipple Bench Allotments. Other reasons for these allotments not meeting Standard 4 are historical grazing (more than 10 years before the determination), Colorado River salinity loading, low flows, hot weather, and natural weathering.

Standard 4 was not met for the Cottonwood, Coyote, Fortymile Ridge, and Upper Paria Allotments, but this was due to factors other than livestock grazing (BLM 2006).

There are three additional allotments in the decision area that did not meet Standard 4 due to natural conditions and geology. Because these factors for not meeting Standard 4 are not issues that the BLM can resolve through management, the allotments were considered to meet rangeland health{ XE "Rangeland Health" } standards. Those allotments are Deer Springs{ XE "Spring" } Point, Wahweap, and Wiregrass (BLM 2006). The criteria and water sources assessed for 303(d) listing and Standard 4 are not necessarily identical.

Range Improvements{ XE "Range Improvement" } Involving Water

Structural range improvements{ XE "Range Improvement" } involving water in the decision area are dams and reservoirs, earthen check dams, detention dams, retention dams, erosion control dams, dikes and diversions, guzzlers, storage tanks, wells, improved and developed springs{ XE "Spring" }, troughs, rain gauges, water sources, and pipelines. Many of these structural range improvements are considered permanent.

Flash Floods

A flash flood is a rapid rise of water (generally within six hours) along a stream or low-lying area after a heavy rainfall or from the failure of a dam, levee, or ice jam. Flash floods occur in the planning area, such as in canyons and washes. The National Weather Service Salt Lake City office produces a flash flood potential rating for areas such as Glen Canyon and GSENM. It is issued twice daily during the summer and fall, approximately mid-May to late October (National Oceanic and Atmospheric Administration 2013). The flash flood potential rating provides information on flash flooding for the next two days.

Flash floods can affect livestock grazing and water resources. They can damage fences or water-related range improvements{ XE "Range Improvement" } and increase the potential for erosion by stripping vegetation and other soil stabilizing agents from the landscape. This is more likely to occur where vegetation has already been degraded. They can also alter drainage patterns and deposit unusually high volumes of sediment or pollutants in water resources. The longevity of impacts from flash floods varies depending on a variety of factors, including the location, intensity, and duration of the flash flood, the integrity of land surface conditions before the flash flood, and the type and location of structures.

3.4.2 Trends

Total dissolved solids are a water quality problem in GSENM. This is due to erosion and the composition of the local geology. Temperature, total phosphorus, and benthic macroinvertebrate bioassessments are also water quality problems. Based on limited data, these water quality problems are believed to be consistent and are not worsening.

Clean Water Act Section 319 funding is awarded each year to the State of Utah through a grant from the EPA. Section 319(h) funds are distributed at the local level to help address water quality issues resulting from nonpoint source pollution. In 2012, Utah BLM continued to implement a Healthy Lands and Watershed Restoration Program, focused on improving habitat, vegetation, and water quality by reducing erosion from BLM-managed lands. These efforts included many watershed improvement projects that will contribute to improved land health and long-term reduction of erosion and sediment loading; this, in turn, will reduce total dissolved solids (salinity).

Projects in GSENM include the Escalante River Watershed Partnership, which involved woody invasive control, restoration, and inventory projects. Woody invasive control also was implemented in Glen Canyon. GSENM projects also included watershed improvement and riparian projects. Glen Canyon projects included water quality monitoring, grazing management, dreissenid mussel prevention, riparian restoration, and special projects related to off-highway vehicles{ XE "Off-Highway Vehicle (OHV)" } (OHVs), Lake Powell, and bank erosion on the Colorado River (DEQ 2013).

For the Colorado Plateau ecoregion{ XE "Ecoregion" }, creeks, streams, and rivers have experienced diminished in-stream flow and altered flow created by dams, channelization, canal systems, and water diversions (Bryce et al. 2012). River flow regulation, channelization, levees, and dikes have eliminated spring{ XE "Spring" } flooding in some cases.

New diversions are occasionally developed and new water rights are occasionally obtained. Although water uses are relatively static, use of Wide Hollow Reservoir has increased slightly, and Henrieville water use has also increased. Livestock water uses have remained fairly static.

Since 2006, the BLM, in coordination with permittees, has made changes in the Vermilion and Rock Creek-Mudholes allotments, which failed to meet Standard 4 due to livestock grazing. Such changes include voluntarily not grazing livestock, removing feral cattle, maintaining or installing spring{ XE "Spring" } and pasture fencing, and implementing new water developments. As a result of these changes, areas that did not meet standards are now making progress toward doing so, based on recent PFC assessments. See **Table 3-4**, Allotments Not Meeting Rangeland

Health{ XE "Rangeland Health" } Standards and Actions Taken Since 2006~~Allotments Not~~ information.

Utah's weather is prone to extremes, from severe flooding to multiyear droughts (Wilkowske et al. 2003). Major floods occurred in 1952, 1965, 1966, 1983, and 1984, and multiyear droughts occurred from 1896 to 1905, 1930 to 1936, 1953 to 1965, 1974 to 1978, 1988 to 1993, and 1999 to 2002. During 2002, some areas of Utah experienced record-low stream flows. The extent of floods is generally limited in size from one to several watersheds. Droughts generally affect most or all of the state.

The BLM issued IM 2013-094, Resource Management During Drought, to provide general guidance and specific livestock grazing program guidance. Although this guidance is centered on the biological resource programs that have direct impacts on the long-term health of rangelands, the communication and coordination principles apply to many other resource programs as well.

The procedures outlined in the IM provide guidelines for line managers regarding their approach to formulating and implementing actions to mitigate the effects of BLM authorized uses on drought-stressed resources.

Not all procedures will be applicable to all situations and where necessary, these may be adapted or modified to suit local circumstances. This policy is supplemental to standard BLM program procedures and is intended to be used as a tool to help address and mitigate the impacts of drought (IM 2013-094).

3.4.3 References

BLM (United States Department of the Interior, Bureau of Land Management). 1997. Standards for Rangeland Health{ XE "Rangeland Health" } and Guidelines for Grazing Management for BLM Lands in Utah. BLM, Utah State Office.

______. 2006. Rangeland Health{ XE "Rangeland Health" } Determination. BLM, Grand Staircase-Escalante National Monument, Utah.

BLM GIS. 2014. Base GIS data on file with BLM's eGIS Server, used for calculations or figures to support the MMP{ XE "Monument Management Plan, Grand Staircase-Escalante National Monument (MMP 2000)" }-A. BLM, Grand Staircase Escalante National Monument, Utah.

Bryce, S. A., J. R. Strittholt, B. C. Ward, and D. M. Bachelet. 2012. Colorado Plateau Rapid Ecoregional Assessment Report. Prepared for the United States Department of the Interior, Bureau of Land Management, Denver, Colorado.

DEQ (Utah Department of Environmental Quality). 2013. Utah Nonpoint Source Pollution Management Program, Fiscal Year 2012, Annual Report. In cooperation with NPS Task Force. January 2013.

______. 2014. Water Quality Assessment. Utah Department of Environmental Quality, Division of Water Quality. Internet website: http://www.waterquality.utah.gov/WQAssess/.

Freethey, Geoffrey W. 1997. "Hydrogeology and water resources of the Grand Staircase Escalante National Monument." *In:* Learning from the Land: Grand Staircase-Escalante National Monument Symposium Proceedings (Linda H. Hill and Janine J. Koslak, editors). November 4 and 5, 1997, Southern Utah University. Bureau of Land Management, Utah State Office, Salt Lake City, Utah. Internet website: http://www.blm.gov/pgdata/etc/medialib/blm/ut/grand_staircase-escalante/science___research/1997_symposium.Par.66473.File.dat/poster05.htm.

Millennium Science & Engineering, Inc. Undated(a). Escalante River Watershed Water Quality Management Plan. Prepared for Utah Department of Environmental Quality Division of Water Quality.

_____. Undated(b). Paria River Watershed Water Quality Management Plan. Prepared for Utah Department of Environmental Quality Division of Water Quality.

National Oceanic and Atmospheric Administration. 2013. Flood Safety Awareness and Preparedness, Flash Flood Potential Rating. Internet website: http://www.wrh.noaa.gov/slc/wxsafety/flood/floodsafetyawarenesspreparedness.html.

NHD (National Hydrography Dataset) GIS. 2014. GIS data of planning area hydrologic features displayed on Surface Water figure. United States Geologic Survey. Internet website: http://nhd.usgs.gov/.

NPS (United States Department of the Interior, National Park Service). 1999. Glen Canyon National Recreation Area Grazing Management Plan{ XE "Grazing Management Plan, Glen Canyon (GzMP 1999)" } and Finding of No Significant Impact. NPS, Glen Canyon National Recreation Area, Page, Arizona. August 1999.

_____. 2006. Management Policies. United States Department of the Interior, National Park Service. ISBN 0-16-076874-8.

Robson, S. G., and E. R. Banta. 1995. Ground Water Atlas of the United States, Arizona, Colorado, New Mexico, Utah, HA 730-C. United States Geological Survey. Internet website: http://pubs.usgs.gov/ha/ha730/ch_c/C-text8.html.

Utah Division of Water Quality. 2010. 2008-2010 Integrated Report. Salt Lake City, Utah.

_____. 2014. 2012-2014 Integrated Report. Draft version 2. October 3, 2014. Internet website: http://www.deq.utah.gov/ProgramsServices/programs/water/wqmanagement/assessment/currentIRoct.htm#draft.

Utah Division of Water Quality GIS. 2015. GIS data of 303d assessment units from the 2014 Draft Integrated Report. Data received via e-mail October 2015.

Utah Division of Water Resources. 2014. Utah's Water Supply. Internet website: http://www.water.utah.gov/brochures/uws_broc.htm.

Western Regional Climate Center. 2015. Climate of Utah. Internet web site: http://www.wrcc.dri.edu/narratives/UTAH.htm.

Wilkowske, Chris D., David V. Allen, and Jeff V. Phillips. 2003. Drought Conditions in Utah During 1999-2002: A Historical Perspective. USGS Fact Sheet 037 03. United States Geological Survey. April 2003.

Woody Invasive Control Committee. 2010. Final Draft. Woody Invasive Control Plan. Appendix A of the Action Plan. Escalante River Watershed Partnership. November 10, 2010.

3.5 Recreation

Recreation is a major and growing use of BLM- and NPS-managed lands in the planning area. The planning area's unique geologic, historic, and scenic features create a desirable setting for outdoor recreationists. Popular recreation in the planning area is camping, hiking, backpacking, hunting, OHV{ XE "Off-Highway Vehicle (OHV)" } use, and driving for pleasure. Visitors to GSENM also fish, mountain bike, and kayak, but these activities are less popular in comparison to the others. Popular recreation next to the planning area at Lake Powell is boating, fishing, and swimming. Other popular recreation destinations in the region are Grand Canyon, Zion, Bryce Canyon, and Capitol Reef National Parks, and the Dixie and Kaibab National Forests. Proximity to these areas allows visitors to access GSENM and Glen Canyon.

In addition to the general mandates and authorities described in **Chapter 1**, recreation in the planning area is managed consistent with the GSENM MMP{ XE "Monument Management Plan, Grand Staircase-Escalante National Monument (MMP 2000)" } (BLM 2000), KFO RMP (BLM 2008a), ASFO RMP (BLM 2008b), Glen Canyon GMP{ XE "General Management Plan, Glen Canyon (GMP 1979)" } (NPS 1979). Moreover, Glen Canyon enabling legislation (PL 92-593) states that Glen Canyon was established "…in order to provide for public outdoor recreation use and enjoyment of Lake Powell and lands adjacent thereto in the States of Arizona and Utah."

3.5.1 Current Conditions

GSENM

There are four management zones in GSENM (see **Figure 3-8**~~Figure 3-8~~, Management Zones).

These zones reflect the location, type of recreational setting, and subsequent opportunities likely to be available to users in GSENM. Each zone's geographic boundary is defined by such factors as the accessibility to and movement in the area via existing roads or trails, sensitive habitats, terrain, and special management area designation boundaries.

The four management zones in GSENM are as follows:

- The Frontcountry Zone (78,100 acres, or 4 percent of GSENM) is intended to be the focal point for visitation by providing day-use opportunities near adjacent communities and Highways 12 and 89, which traverse GSENM. This zone will accommodate the primary interpretation sites, overlooks, trails, and associated facilities necessary to feature GSENM resources. The zone boundaries were developed by locating a corridor along Highways 12 and 89, Johnson Canyon Road,

and the portion of Cottonwood Canyon Road leading to Grosvenor Arch. The zone was then expanded or constricted to coincide with the dominant terrain features, which provide identifiable boundaries on the ground. Existing destinations such as

Figure 3-8 Management Zones

Grosvenor Arch, the Pahreah townsite, and the Calf Creek Recreation Area were included in order to provide for necessary improvements and to accommodate expected visitation. Lands close to Escalante were also included due to extensive visitor use. In delineating this zone, WSAs, threatened and endangered species habitat, relict plant areas, riparian areas{ XE "Riparian Area" }, and other sensitive resources were avoided where possible. Highway 89, from the western boundary to The Cockscomb, lacks dominant terrain to delineate this zone. For this reason, a one-mile buffer along each side of the highway was used.

- The Passage Zone (39,000 acres, or 2 percent of GSENM) includes secondary travel routes that receive use as throughways and recreation destinations. While rudimentary facilities necessary for safety, visitor interpretation, and for the protection of resources will be allowed in this zone, the BLM will generally avoid directing or encouraging further increases in visitation due to the condition of routes and distance from communities. The primary criterion for developing the zone boundaries was dominant terrain. The boundary does not constrict closer than 100 feet to designated routes and encompasses most obvious imprints of human activities such as trailheads, transmission rights-of-way, and potential resource interpretation sites within 0.5 mile of the subject route. In many cases, dominant terrain was not available along route segments. In these cases, a 660-foot buffer was used. Again, WSAs, threatened and endangered species habitat, relict plant areas, riparian areas{ XE "Riparian Area" }, and other sensitive resources were avoided wherever possible.
- The Outback Zone (537,700 acres, or 29 percent of GSENM) is intended to provide an undeveloped, primitive, and self-directed visitor experience, while accommodating motorized and mechanized access on designated routes. Facilities will be rare and will be provided only when essential for resource protection. The remaining public routes not in the Frontcountry or Passage Zones are included in the Outback Zone. Dominant terrain was again a primary criterion for the zone boundary. The boundary does not constrict closer than 100 feet to the routes. WSAs were avoided where possible.
- The Primitive Zone (1,210,600 acres, or 65 percent of GSENM) is intended to provide an undeveloped, primitive, and self-directed visitor experience without motorized or mechanized access. Some administrative routes are included in this zone, which could allow very limited motorized access. Facilities will be nonexistent, except for limited signs for resource protection or public safety. The zone is intended to facilitate landscape-scale research and therefore connects each of the three major landscapes (Escalante Canyons, Kaiparowits Plateau, and Grand Staircase), as well as linking low elevation areas to higher elevations. This zone is also intended to connect primitive and undeveloped areas on surrounding lands managed by other federal agencies (BLM 2000).

The BLM manages six SRMAs{ XE "Special Recreation Management Area (SRMA)" } in GSENM (Figure 3-9~~Figure 3-9~~, Recreation). Compared to areas outside SRMAs, BLM management emphasizes the maintenance and enhancement of recreation users' experiences by preserving a unique setting and providing recreation facilities and other features to promote that experience.

FOIA001:01673156

In total, the BLM managed for a total of 445,100

Figure 3-9 Recreation

1

backcountry visits in the SRMAs{ XE "Special Recreation Management Area (SRMA)" }. This included OHV{ XE "Off-Highway Vehicle (OHV)" } use, picnicking, and hiking and backpacking from the trailheads. Outside of SRMAs, there were 14,100 visits in 2014 (BLM 2014). Within SRMAs, management actions may be necessary to reduce user conflicts and maintain users' safety, while maintaining the quality of the areas' natural resources. Management prescriptions for the six SRMAs in GSENM are as follows (BLM 2000):

- SRMA{ XE "Special Recreation Management Area (SRMA)" }-2 Escalante Canyons SRMA (509,400 acres) The boundary of this SRMA will follow the geographical topography, including all the tributaries to the main Escalante Canyon. It will include trailheads for all the popular routes into the canyons. Activities in this SRMA are backpacking, canyoneering, nonmotorized boating, and horseback riding. The overall recreation experience will continue to be primitive, uncrowded, and remote. Overall, social encounters will remain low, compared to other southwest canyon hiking opportunities. However, a range of social encounters will be available. Potential permit systems could address general public, commercial, and administrative users. There were approximately 200,300 backcountry visits to the Escalante Canyons SRMA in 2014.
- SRMA{ XE "Special Recreation Management Area (SRMA)" }-3 Paria/Hackberry SRMA (271,400 acres) This area is bordered on the west by Kitchen Canyon Road, on the east by Cottonwood Canyon Road corridor, on the south by the confluence of Hackberry/Cottonwood Creeks and the Paria River, and on the north by Dixie National Forest, excluding the Skutumpah corridor. Activities in this SRMA are backpacking, canyoneering, and horseback riding. The overall recreation experience will continue to be primitive, uncrowded, and remote. Equestrian opportunities will be emphasized in Paria Canyon, while backpacking opportunities will be emphasized in Hackberry Canyon. Potential permit systems could address general public use and commercial users. There were approximately 110,400 backcountry visits to the Paria-Hackberry SRMA in 2014.
- SRMA{ XE "Special Recreation Management Area (SRMA)" }-4 Paria Canyon and Plateaus SRMA (29,900 acres) This area encompasses Buckskin Mountain, West Clark Bench, and Cedar Mountain to connect to the BLM Arizona Strip's "Canyons and Plateaus of the Paria Resource Conservation Area." These areas are south of Highway 89, with the Monument boundary marking the east boundary. Activities in this SRMA are canyoneering, horseback riding, backpacking, hiking, hunting, and scenic touring along the House Rock Valley Road. The overall recreation experience will continue to be primitive, uncrowded, and remote.

  Overall social encounters will remain low, compared to other southwest canyon hiking opportunities. However, a range of social encounters will occur. Management of this SRMA{ XE "Special Recreation Management Area (SRMA)" } will be in coordination with the Kanab and the Arizona Strip Field Offices. There were approximately 49,300 backcountry visits to the Paria Canyon and Plateaus SRMA in 2014.

- SRMA{ XE "Special Recreation Management Area (SRMA)" }-5 Fiftymile Mountain SRMA (157,600 acres) This area includes the geographical area called Fiftymile Mountain, including trail access points. Activities in this SRMA are horseback riding, backpacking, and hunting. The recreation experience will be primitive, uncrowded, and remote. Commercial outfitting will be extremely limited. There is a history of grazing and ranching in this SRMA. There were approximately 800 backcountry visits to the Fiftymile Mountain SRMA in 2014.
- SRMA{ XE "Special Recreation Management Area (SRMA)" }-6 Highway 12 Corridor SRMA (24,000 acres) This area encompasses the Highway 12 corridor in GSENM, including the Calf Creek Campground and Interpretive Trail. Activities in this SRMA are scenic driving, day-use hiking, camping, horseback riding, road bicycling, and scenic and interpretive viewing. The recreation experience will focus on learning about geology, history, archaeology, biology, and paleontology, in addition to scenic viewing. Short interpretive trails and scenic overlooks will be developed to encourage visitors to learn more about these GSENM resources. Opportunities will accommodate all visitors. Information stations in Boulder, Escalante, and Cannonville will disseminate educational materials to further information about these resources. There were approximately 68,200 backcountry visits to the Highway 12 Corridor SRMA in 2014.
- SRMA{ XE "Special Recreation Management Area (SRMA)" }-7 Highway 89 Corridor SRMA (40,300 acres) This area encompasses the Highway 89 corridor in GSENM, including the Paria Movie Set, the old Pahreah townsite, and the Paria Contact Station. Activities are scenic driving, day-use hiking, camping, road and mountain bicycling, and scenic and interpretive viewing. The recreation experience will focus on learning about geology, history, archaeology, biology, and paleontology, in addition to scenic viewing. Short interpretive trails and scenic overlooks will be developed to encourage visitors to learn more about these GSENM resources. Opportunities will accommodate all visitors. This corridor will be coordinated with the Vermilion Cliffs Highway Project. There were approximately 16,100 backcountry visits to the Highway 89 Corridor SRMA in 2014.

BLM-managed lands outside GSENM and Glen Canyon

BLM-managed lands outside GSENM and Glen Canyon account for less than three percent of the planning area. The KFO manages most of these areas (65,500 acres). Of the total portion of the planning area in the KFO, 35 percent (22,800 acres) are in the Escalante SRMA{ XE "Special Recreation Management Area (SRMA)" } and another 11,200 acres (17 percent) are in the Paria Canyon SRMA, which includes the Canyon and Uplands Recreation Management Zones (BLM 2008a).

The Kanab RMP contains specific management objectives for each SRMA{ XE "Special Recreation Management Area (SRMA)" }. In addition, for each SRMA, the RMP identifies the SRMA's recreation niche, primary recreation activities, and desired experiences.

For the Escalante SRMA{ XE "Special Recreation Management Area (SRMA)" }, which is northwest of Escalante and outside GSENM but in the planning area, the recreation niche is a

town-accessible hiking and equestrian trail network, offering views and varied terrain. Recreation objectives are to provide easy access to day-use recreation, such as hiking, photographing, horseback riding, OHV{ XE "Off-Highway Vehicle (OHV)" } touring, canyoneering, and viewing scenery and wildlife. BLM management is intended to provide visitors with easy access to an outdoor setting with a mixture of social opportunities (e.g., at trailheads and at group events) and primitive experiences in the backcountry off trails. Livestock often graze in this SRMA.

In the Paria Canyon SRMA{ XE "Special Recreation Management Area (SRMA)" }, in the southwestern portion of the planning area, the BLM manages for mostly backcountry wilderness recreation in a combination of upland and unique slot canyon features. The SRMA falls within the Canyon and Uplands Recreation Management Zones. The recreation niche for the Canyon Recreation Management Zone consists of world-class wilderness trekking in deep slickrock slot canyons, where visitors hike, explore, backpack, and camp in or along colorful deep canyons, narrow slots, and cliffs. In the Uplands Recreation Management Zone portion of the Paria Canyon SRMA, there are primitive and backcountry adventure recreation opportunities on and around the area's unique upland geologic features. BLM management objectives are to preserve the area's wilderness character, while offering visitors the opportunity to hike, backpack, ride horseback, canyoneer, and camp in the area. Recreation experiences are mostly primitive.

BLM ASFO-managed lands in the planning area are in its extensive recreation management area (ERMA). ERMAs receive only custodial management regarding visitor health and safety, user conflict, and resource protection issues, with no activity level planning.

Glen Canyon

Glen Canyon, managed by NPS, encompasses 318,800 acres in the southeastern portion of the planning area. The portion of Glen Canyon in the planning area accounts for one quarter of the 1,246,000 total acres in Glen Canyon. Established in 1972, one purpose of Glen Canyon is to provide for public enjoyment through diverse land- and water-based recreation; another is to protect scenic, scientific, natural, and cultural resources on Lake Powell, the Colorado River and its tributaries, and surrounding lands. In 2011, Glen Canyon received 2.2 million visitors (NPS 2014), most of these visits took place outside the planning area.

Glen Canyon is divided into four management zones: Recreation and Resource Utilization{ XE "Utilization" }, Development, Cultural, and Natural Zones. Nearly all Glen Canyon lands in the decision area are in the Recreation and Resource Utilization and Natural Zones. No lands in the decision area are in the Cultural Zone (see **Table 3-13**, Management Zones on NPS-Managed Lands). There is a small area at the southern terminus of Hole-in-the-Rock Road, which includes the Hole-in-the-Rock historic landmark, in the Development Zone.

Table 3-13
Management Zones on NPS-Managed Lands

Management Zone	Acres
Development Zone	3,700
Natural Zone	212,200
Recreation and Resource Utilization{ XE	93,500

Table 3-13
Management Zones on NPS-Managed Lands

Management Zone	Acres
"Utilization" } Zone	

Source: NPS GIS 2005

Lands in the Recreation and Resource Utilization{ XE "Utilization" } Zone in the planning area consist of dry land and the lake's shoreline. The NPS manages the zone to maintain natural processes and to enhance fish and game populations. Consumption of renewable and nonrenewable resources is subject to the protection of park resources and values{ XE "Resources and Values (Glen Canyon)" }, including recreation.

The Natural Zone includes Glen Canyon's outstanding scenic resources, relatively undisturbed and remote areas, or areas bordering on places with established land use practices that complement characteristics of the Natural Zone. The NPS manages the Natural Zone to maintain isolation and natural processes. Consuming renewable resources is subject to the protection of the recreational and undisturbed natural values of the area. Most of the Natural Zone is proposed for designation as wilderness. Motorized equipment, mechanical transport, and other uses (as described in the Wilderness Act of 1964) are prohibited in the Natural Zone.

The NPS manages the Development Zone to provide visitor services and maintain facilities. This zone includes the permanent structures and operations necessary to support recreation and allows a wide range of recreation.

The most popular activities throughout the entire Glen Canyon and the reasons most people visit the area are sightseeing, motorized boating, swimming, hiking, camping, and backpacking. This recreation is most common in the spring{ XE "Spring" } and summer (NPS 2014). In the Glen Canyon portion of the planning area, motorized boating is not available and the most popular activities are hiking, canyoneering, camping, backpacking, motor touring, and sightseeing.

Year-round paved or graded dirt surface access to Glen Canyon from the north is limited to routes that pass through GSENM. Passenger vehicle access to Glen Canyon is available via Hole-in-the-Rock Road, Burr Trail, Smoky Mountain Road, and Highway 89. Access to the portion of Glen Canyon in the Escalante Canyons area is available via Mood Wash Road as well as by using unmaintained roads and hiking routes that spur from Hole-in-the-Rock Road. Motorized travel is prohibited in the Escalante Canyons area of Glen Canyon.

Recreational Use in Allotments Potentially Unavailable for Livestock Grazing

Table 2-2, Rationale for Unavailable Allotments, summarizes the rationale for certain allotments being unavailable under the various alternatives. For some of the currently unavailable or potentially unavailable allotments, recreation in the allotment is noted as a component of the rationale for that allotment being unavailable; however, no allotment under the alternatives is unavailable solely due to recreation use. This section summarizes the recreation use and opportunities in those allotments.

Big Bowns Bench (River pasture)

This pasture is in the Escalante River corridor and offers unique opportunities for a backcountry recreation experience, solitude, and scenic values. The Escalante River is a popular destination for hikers using Wolverine Canyon, Little Death Hollow, Horse Canyon, Silver Falls Canyon, and Harris Wash. Pack rafting is a popular activity along the Escalante River. The area provides viewing of rock writing panels and imagery for backcountry users.

Circle Cliffs (Gulch and Lampstand pastures)

The Gulch is a popular backpacking destination known for its scenic values. The Upper Gulch has high sandstone walls that offer geologic and scenic values to visitors. The Gulch has intermittent water sources that support multi-day outings and side canyons that offer exploration. The petrified wood forest deposits are a destination for hikers. Because the area is an ecological transition between the desert and the forest, the upper sections offer a unique contrast, with ponderosa trees against Wingate sandstone.

Deer Creek (Cottonwood pasture)

This pasture is remote and difficult to access. Currently there are no vehicle access points available to the public. The pasture offers unique opportunities for solitude, untrammeled recreation, and scenic values. Water is available in the canyon bottoms, but most of the area is dry benches.

Deer Creek (River pasture)

The River pasture, in the Escalante River corridor, is a primary access route into the lower canyons and Glen Canyon. Self exploration and backcountry skills are required to travel through this reach. There are many access routes, providing opportunities to experience the river corridor and the multiple archaeological sites along the river. Recreationists value the riparian resources along the travel routes. The area provides high value opportunities for hiking, backpacking, photography, and self exploration.

Deer Creek (Brigham Tea and Wolverine pastures)

Wolverine Canyon, Horse Canyon, and the expansive sandstone formations offer a unique cross-country travel experience and opportunities for canyoneering. In trailhead registers, users have written that livestock grazing has decreased the quality of recreation in the area.

Dry Valley

The area provides access to lower Slick Rock and Rock Springs{ XE "Spring" } Bench, which is an area used for horseback riding, hunting, and trapping. ATV use is also popular in this area.

King Bench (King Bench pasture)

The area is popular for hiking, backpacking, photographing, and exploring. Unique sandstone formations provide for open cross-county travel with intricate routes. Scenic qualities are exceptional, and perennial{ XE "Perennial" } water sources provide destinations for backpacking. In trailhead registers, users have written that livestock grazing has decreased the quality of recreation in the area.

Lake (Navajo Point pasture)
This pasture, which is predominately in Glen Canyon, is becoming increasingly popular with recreationists. The area has limited water resources, and livestock using those limited water resources has made it difficult for backpackers to have a reliable source of drinking water.

Lower Hackberry
Lower Hackberry is a popular recreation destination. Backpacking, day hiking, and horseback riding are popular activities. Due to narrow canyons, health and safety concerns arise when recreationists and livestock interact in this area.

Mollie's Nipple (portion of Buckskin pasture; Blue Springs{ XE "Spring" }, and Jenny Clay Hole pastures)
OHV{ XE "Off-Highway Vehicle (OHV)" } riding, auto touring, hunting, and trapping are popular recreation opportunities in the area. Upper Buckskin Gulch is a popular destination for day hikers.

Phipps (River pasture)
The area is popular for day hiking, backpacking, photographing, and exploring. Unique sandstone formations provide for open cross-country travel with intricate routes. Scenic qualities are exceptional. Phipps Arch and several archeological sites are destinations for many recreationists. The lower Escalante River is a primary access point to Phipps Arch and Phipps Canyon and is an easy day hike for visitors.

Saltwater Creek
The area is popular for day hiking, backpacking, photographing, and exploring. Unique sandstone formations provide for open cross-country travel with intricate routes. Scenic qualities are exceptional. The area is popular for both day recreation and overnight use, because it includes the Boulder Mail Trail, Sand Creek, and Death Hollow. Riparian areas{ XE "Riparian Area" } and water resources along the canyon bottoms are an attraction.

Steep Creek
This area is remote and difficult to access. Currently there are no vehicle access points available to the public. The area provides unique opportunities for solitude, untrammeled recreation, and scenic values. Water is available in the canyon bottoms, but most of the area is dry benches.

Upper Hackberry (South Jody pasture and Upper Hackberry Canyon)
The area provides hiking access to Upper Hackberry Canyon. Horseback riding also provides access to the lower sections of the Paria River. In trailhead registers, users have written that livestock grazing has decreased the quality of recreation in the area.

3.5.2 Trends

GSENM
Recreation is a major use in GSENM, and the number of people taking part in recreation has increased over the past decade and is expected to continue at a similar rate. In 2013, total visitation was 759,600, an increase of 35 percent since 2000, and the second highest number of yearly visitors since 1997 (BLM 2014). GSENM receives visitors from across the United States

and internationally. In 2004, nearly 25 percent of all recorded visitors to the front country were from outside the United States, while another 30 percent traveled from areas beyond the western United States. Of the nearly 50 percent of visitors from the West, 14 percent were from Utah and another 13 percent from California (Utah State University 2004).

Demographically, visitors are mostly male (approximately 65 percent), older (average age of 50), first time visitors (60 percent), and visiting with just one other person (56 percent). Most visitors to the front country (87 percent) stay more than one day and stay 3.6 days on average (Utah State University 2004). While these numbers provide an indication of visitor use and activity trends, the BLM is neither able to record all visits to GSENM nor to identify the activities that visitors engage in. As a result, it is challenging for the BLM to project how different demographic groups will engage with certain recreation activities in the future.

The BLM expects the most popular recreation activities in GSENM to continue to be pedestrian based activities, such as hiking, walking, backpacking, and photographing, as well as motorized activities, particularly driving for pleasure. In 2013, the most popular trailhead for hiking, with nearly 25,000 visits, was Lower Calf Creek Falls. The Calf Creek Recreation Area trailhead is easily accessed from Highway 12, near the Calf Creek Campground, and within a picturesque canyon feeding into the Escalante River; the nearby Upper Calf Creek trailhead received nearly 20,000 visits in 2013. Dry Fork Slots trailhead, located along Hole-in-the-Rock Road, received approximately 20,000 users; Wire Pass trailhead, near the Stateline Campground at the southern edge of GSENM, which provides access to the world famous geologic feature known as The Wave, received 15,000 visits; and the Toadstools trailhead, located along Highway 89 near the White House Campground, received approximately 8,000 users in 2013 (BLM 2013).

In a study conducted for the popular Hole-in-the-Rock Road area, researchers asked survey participants to select the three recreational activities out of a list of 20 that they engage in most often while in the area. Although the study applied to only a small area of GSENM, and the popularity of certain activities will vary by location, the findings illustrate popular recreation activities within GSENM as a whole. More than 70 percent of respondents engaged in hiking, walking, or running, 45 percent backpacked, and over 30 percent engaged in photography. Although only 24 percent said that they engaged in scenic driving, it is likely that most respondents engaged in this activity but did not consider it a stand-alone recreation. Other recreation noted in the study was hunting, horseback riding, OHV{ XE "Off-Highway Vehicle (OHV)" } riding, and picnicking. Approximately 10 percent of recreationists engage in each of these activities (Colorado Mesa University 2014). The BLM expects similar use in the future.

In the southwestern and northeastern portions of GSENM and along the two major thoroughfares, Highways 12 and 89, motorized and mechanized recreation will likely continue to be among the most popular recreation activities. These areas provide some of the most easily accessible opportunities in GSENM for scenic driving and cycling.

The number of special recreation permits that the BLM issues in GSENM fluctuates annually; however, the BLM anticipates a gradual increase over time. The BLM issued 90 special recreation permits for organized recreation activities in 2014, an increase of 15 percent since 2012 and the most since 2009 (BLM 2014). The BLM issues special recreation permits for hiking tours, horseback and trail rides, outfitting and guiding for hunting, photography, vehicle tours,

backpacking and camping, fishing, ATV tours, and outdoor education. Of the 78 special recreation permits issued in 2013, 24 were for hiking/backpacking, 15 were for hunting, 14 were for education/therapy, 11 were for horseback riding, and 6 were for vehicle tours (BLM 2014).

While permitted uses take place year-round, most occur during the months other than winter. The Escalante Canyons SRMA{ XE "Special Recreation Management Area (SRMA)" } in the northeastern portion of GSENM has the largest number of permit holders. They consist of local, regional, and national operators and guides. In 2011, half of the operators and guides were regional (i.e., those who travel two to eight hours to operate in GSENM). Another 38 percent were local (i.e., in the immediate area). The rest traveled more than eight hours to operate in GSENM. Regional and national operators were from as far away as Minnesota, Michigan, and Alberta, Canada (BLM 2012). Between 2009 and 2013, total revenue from special recreation permits was $735,800 (BLM 2014). Total revenue from special recreation permits is expected to remain steady or to increase slightly.

Historic grazing practices contribute to visitor and recreation experiences in GSENM. In many parts of GSENM, visitors are able to observe the cowboy and ranching lifestyle historic to the area. There are also opportunities for visitors to participate in cattle drives with operators in order to have a first-hand experience.

BLM-managed lands outside GSENM

BLM-managed areas outside GSENM will continue to provide important recreation opportunities for the region's local population and visitors. Within the Paria and Escalante SRMAs{ XE "Special Recreation Management Area (SRMA)" }, the BLM will continue to manage for unique backcountry recreation experiences. In the ASFO's ERMA, visitor use would be regulated only when monitoring indicates a trend toward unacceptable change to desired recreation settings brought about by such use.

Glen Canyon

Visitation to Glen Canyon as a whole has steadily declined since a peak of 3.5 million visitors in 1992-1993. Total visitation fell below two million visitors from 2004 to 2009, but it has rebounded recently with nearly 2.5 million visitors in 2015 (NPS 2016). Despite an overall decline in visitor use to Glen Canyon, visitation in the planning area has increased over time as more visitors discover this area, particularly since the designation of GSENM. Escalante Canyons, the Colorado River (above and below Lake Powell), the Escalante River, and other tributaries attract increasing numbers of hikers, backpackers, and other visitors to areas within the Glen Canyon portion of the planning area.

The number of Commercial Use Authorizations (CUAs) and Special Use Permits (SUPs) that the NPS issues in Glen Canyon fluctuates annually; however, the NPS anticipates the continued increase in land-based recreation and an increase in CUAs and SUPs for land-based activities and services. In 2014, the NPS issued 12 CUAs for land-based recreation, which served 771 visitors park-wide. In 2015, the NPS issued 16 CUAs for land-based recreation, which served 831 visitors. The NPS issues CUAs for guided hiking, backpacking tours, guided canyoneering, vehicle tours, livestock pack tours, and photography tours. Over 90 percent of all backcountry camping permits issued by GSENM in 2013 were for areas in the Escalante Canyons within Glen Canyon (BLM 2013).

3.5.3 References

BLM (United States Department of the Interior, Bureau of Land Management). 2000. Grand Staircase-Escalante National Monument Management Plan{ XE "Monument Management Plan, Grand Staircase-Escalante National Monument (MMP 2000)" } and Record of Decision. BLM, Grand Staircase-Escalante National Monument, Cedar City, Utah. February 2000.

______. 2008a. Kanab Field Office Record of Decision and Approved Resource Management Plan. BLM, Kanab Field Office, Kanab, Utah. October 2008.

______. 2008b. Arizona Strip Field Office Record of Decision and Resource Management Plan. BLM, Arizona Strip Field Office, St. George, Utah. February 2008.

______. 2012. Programmatic EA for Issuing Special Recreation Permits within Grand Staircase Escalante National Monument.

______. 2013. Recreation Management Information System Data, Fiscal Year Range October 1, 2011 September 30, 2012.

______. 2014. Special Recreation Permit Program Business Plan: Grand Staircase Escalante National Monument. WBS# LVRD UT 340000.

Colorado Mesa University. 2014. Grand Staircase-Escalante National Monument Recreational Experience Baseline Study Report: Phase 1: Hole-in-the-Rock Road Area.

NPS (United States Department of the Interior, National Park Service). 1979. Glen Canyon National Recreation Area Proposed General Management Plan{ XE "General Management Plan, Glen Canyon (GMP 1979)" }, Wilderness Recommendation, and Road Study Alternatives Final Environmental Impact Statement.

______. 2014. Glen Canyon National Recreation Area Off-Road Vehicle Management Plan/Draft Environmental Impact Statement. January 2014.

______. 2016. Integrated Resource Management Applications Portal. Glen Canyon NRA Recreation Visitors. Internet website: https://irma.nps.gov/Stats/SSRSReports/Park%20Specific%20Reports/Annual%20Park%20Recreation%20Visitation%20(1904%20-%20Last%20Calendar%20Year)?Park=GLCA.

NPS GIS. 2005. GIS data of Glen Canyon Management Zones. Received via e-mail from the NPS.

Utah State University. 2004. Front Country Visitor Use Study.

3.6 Air Quality and Climate Change

3.6.1 Current Conditions

Air Quality

The federal Clean Air Act (42 USC, Sections 7401-7642) established the principal framework for national, state, and local efforts to protect air quality. The EPA sets regulations and standards to implement the requirements of the Clean Air Act. Under the Clean Air Act, the EPA has set time-averaged National Ambient Air Quality Standards{ XE "National Ambient Air Quality Standards (NAAQS)" } (NAAQS) for six criteria air pollutants considered to be key indicators of air quality: carbon monoxide, nitrogen dioxide, ozone{ XE "Ozone" }, sulfur dioxide, lead, and two categories of particulate matter{ XE "Particulate Matter" } (particulate matter less than 10 microns in diameter [PM_{10}] and particulate matter less than 2.5 microns in diameter [$PM_{2.5}$]). NAAQS are shown in **Table 3-14**, National Ambient Air Quality Standards.

The Clean Air Act requires each state to identify areas that have ambient air quality{ XE "Ambient Air Quality" } in violation of federal standards using monitoring data collected through state monitoring networks, as follows:

- Areas that violate air quality standards are designated as nonattainment for the relevant criteria air pollutants.
- Areas that comply with air quality standards are designated as attainment for the relevant criteria air pollutants.
- Areas that have been redesignated from nonattainment to attainment are considered maintenance areas.

Table 3-14
National Ambient Air Quality Standards{ XE "National Ambient Air Quality Standards (NAAQS)" }

Pollutant	Averaging Time	National Standards[1]		
		Primary	Secondary	Form
Ozone{ XE "Ozone" }	8-hour	0.070 ppm[2]	Same as primary	Annual 4th-highest daily maximum 8-hour concentration, averaged over three years
Carbon monoxide	8-hour	9 ppm	--	Not to be exceeded more than once a year
	1-hour	35 ppm	--	
Nitrogen dioxide	Annual (arithmetic mean)	0.053 ppm	Same as primary	Annual mean
	1-hour	100 ppb	--	98th percentile, averaged over three years
Sulfur dioxide	3-hour	--	0.5 ppm	Not to be exceeded more than once a year
	1-hour	75 ppb[3]	--	99th percentile of 1-hour daily maximum concentrations, averaged over three years

Table 3-14
National Ambient Air Quality Standards{ XE "National Ambient Air Quality Standards (NAAQS)" }

Pollutant	Averaging Time	National Standards[1]		
		Primary	Secondary	Form
PM_{10}	24-hour	150 µg/m^3	Same as primary	Not to be exceeded more than once a year, on average, over three years
$PM_{2.5}$	Annual (arithmetic mean)	12 µg/m^3	15 µg/m^3	Annual mean, averaged over three years
	24-hour	35 µg/m^3	Same as primary	98th percentile, averaged over three years
Lead[4]	Rolling three-month average	0.15 µg/m^3	Same as primary	Not to be exceeded

Source: EPA 2016

[1]Primary standards set limits to protect public health, including the health of sensitive populations, such as asthmatics, children, and the elderly. Secondary standards set limits to protect public welfare, including protection against decreased visibility and damage to animals, crops, vegetation, and buildings.

[2]ppm parts per million. Final rule signed October 1, 2015, and effective December 28, 2015. The previous (2008) ozone{ XE "Ozone" } standards additionally remain in effect in some areas. Revocation of the previous (2008) ozone standards and transitioning to the current (2015) standards will be addressed in the implementation rule for the current standards. The 1-hour ozone standard is attained when the expected number of days per calendar year with maximum hourly average concentrations above 12 ppm is less than or equal to 1.

[3]ppb parts per billion. Final rule signed June 2, 2010. The 1971 annual and 24-hour sulfur dioxide standards (0.03 ppm annual and 0.14 ppm 24-hour) were revoked in that same rulemaking. However, these standards remain in effect until one year after an area is designated for the 2010 standard. One exception is in areas designated as nonattainment for the 1971 standards; in such cases the 1971 standards remain in effect until implementation plans to attain or maintain the 2010 standard are approved.

[4]µg/m^3 micrograms per cubic meter. Final rule signed October 15, 2008. The 1978 lead standard (1.5 µg/m^3) remains in effect until one year after an area is designated for the 2008 standard. The one exception is in areas designated as nonattainment for the 1978 standard; in such cases the 1978 standard remains in effect until implementation plans to attain or maintain the 2008 standard are approved.

- Areas of uncertain status[11] are generally designated as unclassifiable but are treated as attainment areas{ XE "Attainment Area" } for regulatory purposes.

The planning area includes lands in Garfield and Kane Counties, Utah, and Coconino County, Arizona. These counties are in attainment with or unclassified for all of the NAAQS{ XE "National Ambient Air Quality Standards (NAAQS)" } shown in Table 3-14~~Table 3-14~~; none are maintenance areas for any of the NAAQS (EPA 2015a).

Under the Clean Air Act, states are granted the authority to operate air quality monitoring networks for criteria pollutant{ XE "Criteria Pollutant" } concentrations. The data collected through these stations form the basis of the NAAQS{ XE "National Ambient Air Quality

[11] This would be in cases where are not enough monitoring data to support an attainment or nonattainment designation; often this is because monitoring is determined to be unnecessary, due to good air quality or a lack of pollutant emission sources.

Standards (NAAQS)" } designations within a state. Utah operates two air monitoring stations in the vicinity of GSENM: one in Escalante in Garfield County, in the MMP{ XE "Monument Management Plan, Grand Staircase-Escalante National Monument (MMP 2000)" }-A planning area; and one in Washington County, west of both GSENM and Zion National Park, near Interstate 15 (DEQ 2015). There are no monitoring stations in Arizona within 100 miles of GSENM, and air quality in Coconino County is assumed to be similar to that in Garfield and Washington Counties, Utah (Arizona Department of Environmental Quality 2012).

Table 3-15, Air Quality Monitoring Values, Garfield and Washington Counties, Utah~~Air Quality~~ criteria pollutants{ XE "Criteria Pollutant" } monitored at this station, using monitoring data from the last three available years (EPA 2015b); as shown, none of the NAAQS{ XE "National Ambient Air Quality Standards (NAAQS)" } monitored were exceeded. All average concentrations except ozone{ XE "Ozone" } are well below NAAQS.

Table 3-15
Air Quality Monitoring Values, Garfield and Washington Counties, Utah

Pollutant	Averaging Time	2012	2013	2014	3-Year Average	NAAQS { XE "National Ambient Air Quality Standards (NAAQS)" }	Percent of NAAQS{ XE "National Ambient Air Quality Standards (NAAQS)" }
755 West Main, Escalante, Utah (Garfield County)							
Ozone{ XE "Ozone" }	8-hour (ppm)	0.068	0.067	0.060	0.065	0.070	93
147 North 870 West, Hurricane, Utah (Washington County)							
Ozone{ XE "Ozone" }	8-hour (ppm)	0.059	0.069	0.066	0.060	0.070	86
Nitrogen Dioxide	1-hour (ppb)	22	28	24	24.67	100	25
PM_{10}	24-hour (µg/m)	-	-	47	-	150	-
$PM_{2.5}$	24-hour (µg/m)	12	12	9	11.00	35	31
	Annual Mean (µg/m)	6.6	6.3	4	5.63	12	47

Source: EPA 2015b, 2016

Clean Air Act General Conformity

The EPA general conformity rule requires a federal agency to prepare a formal conformity determination document for actions that it undertakes, approves, or funds in federal nonattainment or maintenance areas. This rule applies when the total net change in direct and indirect emissions of nonattainment pollutants (or their precursors) exceeds specified

thresholds. Because the counties in the planning area are not in nonattainment or maintenance areas, the general conformity rule does not apply.

Prevention of Significant Deterioration

Prevention of significant deterioration regulations in the Clean Air Act apply to areas that are in attainment of the NAAQS{ XE "National Ambient Air Quality Standards (NAAQS)" } from being polluted up to the level of the standards. The Clean Air Act directs the EPA to classify air sheds as Class I, Class II, or Class III. Class I air sheds are national parks and wilderness areas of a certain size that were in existence before 1977 or additional areas that have since been designated by federal regulation. Class I air sheds represent areas that should be given special protection. Class II air sheds are areas that would receive less protection than Class I areas. Class III air sheds require the least stringent air quality protection, and air quality in these areas would be permitted to degrade air quality up to the NAAQS.

There are five Class I air sheds within 62 miles (100 kilometers) of GSENM: Zion National Park, Bryce Canyon National Park, Grand Canyon National Park, Capitol Reef National Park, and Canyonlands National Park (BLM GIS 2014, WFDSS GIS 2009; **Figure 3-10**~~Figure 3 10~~, Class There are no tribal Class I air sheds within 62 miles (100 kilometers) of the planning area (NPS 1998). Class II air sheds are the remaining areas outside Class I areas. No areas in the United States have been designated as Class III.

Prevention of significant deterioration regulations limit the total increase in ambient pollution levels above established baseline levels for sulfur dioxide, nitrogen dioxide, and PM_{10}.

Climate Change

Climate represents the long-term statistical characterization of daily, seasonal, and annual weather conditions such as temperature, relative humidity, precipitation, cloud cover, solar radiation, and wind speed and direction. Climate is the composite of generally prevailing weather conditions of a particular region throughout the year, averaged over a series of years. A region's climate is affected by its latitude, terrain, and altitude, as well as nearby water bodies and their currents.

Climate change{ XE "Climate Change" } is a statistically significant and long-term change in climate patterns. The terms climate change and global warming are often used interchangeably, although they are not the same thing. Climate change is any deviation from the average climate, whether warming or cooling, and can result from both natural and man-made sources. Natural contributors include fluctuations in solar radiation, volcanic eruptions, and plate tectonics. Global warming refers to the apparent warming of climate observed since the early twentieth century. It is primarily attributed to human activities, such as fossil fuel combustion, industrial processes, and land use changes.

All federal agencies are mandated under Executive Order 13514 to "evaluate agency climate-change risks and vulnerabilities to manage the effects of climate change on the agency's operations and mission in both the short and long term."

Figure 3-10 Class I Airsheds

Climate

The planning area's climate is determined by the following:

- Its distance from the equator
- Its elevation above sea level
- Its location with respect to the average storm paths over the Intermountain Region
- Its distance from the principal moisture sources of the area, namely, the Pacific Ocean and the Gulf of Mexico

The mountain ranges over the western United States, particularly the Sierra Nevada and Cascade Ranges and the Rocky Mountains, have a marked influence on the climate of the planning area. Pacific storms, before reaching Utah, must first cross the Sierra or Cascade Ranges. As the moist air is forced to rise over these high mountains, a large portion of it falls as precipitation. Thus, the prevailing westerly air currents reaching Utah are comparatively dry, resulting in light precipitation over most of the state (Western Regional Climate Center 2015).

The climate in the planning area is semiarid. The average annual precipitation for the planning area is 10 to 20 inches, with areas around Lake Powell, which straddles Arizona and Utah, receiving less than 10 inches and areas north-northeast of Kanab, Utah, receiving 20 to 30 inches. Escalante, Utah, has an average annual precipitation of 11 inches (Western Regional Climate Center 2015), most of which falls from November through March.

The area experiences a bimodal precipitation pattern, with peaks in the summer and winter. During July, August, and September, precipitation comes to the area by way of thunderstorms as part of the North American monsoon. These thunderstorms tend to advance northward out of Arizona, producing isolated, but often heavy, storms. Because of the way these thunder cells form, it is common for one area to receive heavy rain, while just a few miles away, no precipitation falls. During the winter, precipitation mainly falls as snow, with some rain showers in the valleys. These winter storms advance into the region from out of the northwest portion of the United States and are much more widespread than summer storms (BLM 2008).

Summer temperatures vary approximately 30 degrees Fahrenheit (°F), with highs in the mid- to upper 90s and lows in the mid-60s. Winters in Escalante have a temperature range of about 26 °F, with highs in the low 40s and lows of about 15 °F. Snowfall in GSENM generally averages 28 inches, beginning in October or November and ending in March or April (DesertUSA 2015).

3.6.2 Trends

Air Quality

Under 54 USC, Section 100101(a) et seq., the NPS is charged with maintaining national park units and their resources unimpaired for the enjoyment of future generations. The Northern Colorado Plateau Network includes six national parks that are designated as Class I air sheds (Perkins 2010). Four of these national parks Bryce Canyon, Capitol Reef, Canyonlands, and Zion are within 62 miles (100 kilometers) of GSENM (BLM GIS 2014, WFDSS GIS 2009). Grand Canyon National Park, also a Class I air shed, is next to the Northern Colorado Plateau

Network and is also within 62 miles (100 kilometers) of the planning area. The location of these parks in relation to the planning area is shown on Figure 3-10~~Figure 3-10~~, Class I

The Northern Colorado Plateau Network has identified three aspects of air quality as high-priority vital signs for long-term natural resources monitoring: atmospheric deposition, ozone{ XE "Ozone" }, and visibility. Over the past three decades, the NPS has developed several internal and cooperative programs for monitoring air quality. The latest trend results of this cooperative monitoring are compiled in the Air Quality Monitoring in the Northern Colorado Plateau Network Annual Report, which reported air quality trends from 1999 to 2008 in the national parks in its network (Perkins 2010). The trends results from monitoring in the four parks surrounding the planning area are described below (Perkins 2010):

- Visibility improved on the 20 percent clearest days in all Northern Colorado Plateau Network parks where measurements were taken. Trends for parks farther south on the Colorado Plateau, including Grand Canyon National Park, remained stable. Visibility trends were stable on the 20 percent haziest days for all Northern Colorado Plateau Network parks and surrounding parks.
- Sulfates decreased significantly (improving air quality), and nitrates and ammonium were stable at Bryce Canyon. All three ions were stable at Canyonlands National Park. At Grand Canyon National Park, none of the three ions showed a significant trend, but nitrates and sulfates were very close to showing a declining trend.
- Average ozone{ XE "Ozone" } levels remained stable at Canyonlands, Grand Canyon, and Zion National Parks. However, ozone levels in these parks are close to the NAAQS{ XE "National Ambient Air Quality Standards (NAAQS)" } standard for ozone at Canyonlands National Park or exceed the standard at Grand Canyon and Zion National Parks. Increasing concentrations are possibly due to increasing regional emissions of nitrogen oxides, changes in the distribution of emissions, increased biomass burning, or increased global background ozone (Perkins 2010).

More recent data are available from the NPS's Air Quality Conditions and Trends by Park website. Information on parks near the planning area support the trends reported above:

- For 2004 to 2013, the trend in ozone{ XE "Ozone" } concentrations at Canyonlands, Grand Canyon, and Zion National Parks remained relatively unchanged. Average ozone levels in the three parks from 2009 to 2013 were 0.0691 ppm, 0.0717 ppm, and 0.0713 ppm, respectively.
- For 2004 to 2013, the trend in visibility remained relatively unchanged on both the 20 percent clearest days and the 20 percent haziest days in Canyonlands National Park; the trend remained relatively unchanged on the 20 percent clearest days and improved on the 20 percent haziest days in Grand Canyon National Park; the trend remained relatively unchanged on the 20 percent clearest days and improved on the 20 percent haziest days in Zion National Park (NPS 2013).

Climate Change

The Northern Colorado Plateau Network 2011 Climate Monitoring report (Witwicki 2013) provides past climate trends data for the region that includes the planning area. The report described the following trends:

- An increase in mean annual maximum temperature.
- An increase in the mean annual minimum temperature, including an annual increase over the past 30 years of 0.12 °F. This corresponded with a general increase in mean annual minimum temperature noted in other western United States regions since the 1970s and in Alaska since the 1990s.
- Annual precipitation was variable through time, with no strong negative or positive trend noted among weather stations in the network.
- Ten of the 16 stations with snowfall data had a significant negative slope (decrease), but none of the stations exhibited a strong trend. Snowfall records indicate a decline in snowfall at many network stations from the 1980s to mid-2000s, but average to above-average snowfall for many of the last few years. Snowfall totals for 2011 were extremely low at seven stations in southeast Utah.
- The 25- to 50-year observation period for most of the network stations illustrates general, common trends among stations but is of insufficient length to begin to discern climatic regime shifts. However, the 106-year observation period of the Zion station offers a perspective of climate variability and trends. Similar to most stations, the Zion station recorded increases in mean annual maximum and minimum temperatures over the past two to three decades and in rainfall in the recent past. However, periods of similar increases are evident in the historical record, and recent temperature and precipitation values do not exceed historical maximums. Trend assessments did indicate slightly increasing temperature and declining snowfall over this extended period, but they generally showed much lower amounts of the variance than those that were based on a shorter duration (Witwicki 2013).

Climate change{ XE "Climate Change" } predictions for the Colorado Plateau ecoregion{ XE "Ecoregion" }, which includes the southeastern half of Utah, western Colorado, northern New Mexico, and northwestern Arizona, are described below. Climate change predictions for this ecoregion are excerpted from the Utah Greater Sage-Grouse{ XE "Greater Sage-Grouse" } Proposed Land Use Plan/Final EIS (BLM 2015) as follows:

> Climate change{ XE "Climate Change" } modeling predictions show that the ecoregion{ XE "Ecoregion" } is expected to undergo general warming over the entire region, with the greatest warming occurring in the southern portion of the ecoregion and with average winter temperatures increasing more than average summer temperatures (Bryce et al. 2012).
>
> Climate change{ XE "Climate Change" } modeling predicts up to a 1°F (0.6°C) increase (2015 to 2030) and 1.8°F (1°C) increase (2045 to 2060) in average summer temperatures in the northern portion of the ecoregion{ XE

"Ecoregion" }. Modeling predicts up to a 1.4°F (0.8°C) increase (2015 to 2030) and 2°F (1.2°C) increase (2045 to 2060) in the southern portion of the ecoregion (Bryce et al. 2012). Climate change modeling predicts up to a 1.4°F (0.8°C) increase (2015 to 2030) and 2°F (1.2°C) increase (2045 to 2060) in average winter temperatures in the northern portion of the ecoregion; modeling predicts up to a 2.8°F (1.6°C) increase (2015 to 2030) and a 3.6°F (2°C) increase (2045 to 2060) in the southern portion of the ecoregion (Bryce et al. 2012).

Precipitation is expected to decline throughout much of the year from 2015 to 2030, with the exception of a couple of months in the fall; severe droughts are likely in some areas. The 2045 to 2060 period remains drier or comparable to historic conditions during most of the year, but sporadic wetter months (e.g., February, June, and October) could result in overall increases in annual precipitation in some areas (Bryce et al. 2012).

Overall, the southern ecoregion{ XE "Ecoregion" } is expected to experience more extreme long-range climate change effects than the northern ecoregion. This is because the northern ecoregion is north of the influence of the summer monsoon; it may also be considered transitional to the mid- and northern latitudes, where climate change predictions may differ from those for the southwestern region (Bryce et al. 2012). Some models predict that winters in mid-latitudes will be wetter and warmer (Miller et al. 2011).

Additionally, a 2014 analysis of temperature and precipitation at Glen Canyon shows that maximum temperatures in the region have exceeded their historical range (Monohan and Fisichelli 2014).

Climate change{ XE "Climate Change" } information as it pertains to impacts on vegetation, water, and other resources are described in the sections for those resources.

3.6.3 References

Arizona Department of Environmental Quality. 2012. State of Arizona Air Monitoring Network Plan for the Year 2012. Internet website: https://www.azdeq.gov/environ/air/assessment/download/amnp2012.pdf.

BLM (United States Department of the Interior, Bureau of Land Management). 2008. Grand Staircase-Escalante National Monument Draft Monument Management Plan{ XE "Monument Management Plan, Grand Staircase-Escalante National Monument (MMP 2000)" } Amendment and Draft Rangeland Health{ XE "Rangeland Health" } Environmental Impact Statement. October 2008.

______. 2015. Utah Greater Sage-Grouse{ XE "Greater Sage-Grouse" } Proposed LUPA/Final EIS. June 2015.

BLM GIS. 2014. Base GIS data on file with BLM's eGIS Server, used for calculations or figures to support the MMP{ XE "Monument Management Plan, Grand Staircase-Escalante

National Monument (MMP 2000)" }-A. BLM, Grand Staircase Escalante National Monument, Utah.

Bryce, S. A., J. R. Strittholt, B. C. Ward, and D. M. Bachelet. 2012. Colorado Plateau Rapid Ecological Assessment Report. Prepared for the United States Department of the Interior, Bureau of Land Management, Denver, Colorado.

DesertUSA. 2015. Grand Staircase Escalante National Monument, Climate. Internet website: http://www.desertusa.com/escalante/du_esc_map.html.

DEQ (Utah Department of Environmental Quality). 2015. Utah Air Monitoring Network. Internet website: http://www.airmonitoring.utah.gov/network/Counties.htm.

EPA (United States Environmental Protection Agency). 2015a. EPA Green Book. Internet website: http://www3.epa.gov/airquality/greenbook/.

_____. 2015b. EPA AirData, Monitor Values Report. Internet website: http://www3.epa.gov/airdata/ad_rep_mon.html.

_____. 2016. National Ambient Air Quality Standards{ XE "National Ambient Air Quality Standards (NAAQS)" }. Internet website: http://www3.epa.gov/ttn/naaqs/criteria.html.

Miller, R. F., S. T. Knick, D. A. Pyke, C. W. Meinke, S. E. Hanser, M. J. Wisdom, and A. L. Hild. 2011. "Characteristics of sagebrush habitats and limitations to long-term conservation." In: "Greater sage-grouse{ XE "Greater Sage-Grouse" }: Ecology and conservation of a landscape species and its habitats" (S. T. Knick and J. W. Connelly, editors). *Studies in Avian Biology* 38:145-184. University of California Press, Berkeley.

Monohan, W. B. and N. A. Fisichelli. 2014. Recent Climate Change Exposure of Glen Canyon National Recreation Area. Climate Change Resource Brief, National Park Service, Natural Resource Stewardship and Science.

NPS (United States Department of the Interior, National Park Service). 1998. American Indian Class I Lands. Internet website: http://www3.epa.gov/visibility/indc1.pdf.

_____. 2013. 2013 Air Quality Summary Data for Canyonlands, Grand Canyon, and Zion National Parks. Queried from Internet website: http://www.nature.nps.gov/air/data/products/parks/index.cfm.

Perkins, D. W. 2010. Air quality monitoring in the Northern Colorado Plateau Network: Annual Report 2009. Natural Resource Technical Report NPS/NCPN/NRTR 2010/374. National Park Service, Fort Collins, Colorado.

Utah Division of Water Resources. 2014. Utah's Water Supply. Internet website: http://www.water.utah.gov/brochures/uws_broc.htm.

Western Regional Climate Center. 2015. Climate of Utah. Internet website: http://www.wrcc.dri.edu/narratives/UTAH.htm.

_____. 2015b. Escalante, Utah (422592) Period of Record Monthly Climate Summary. Internet website: http://www.wrcc.dri.edu/cgi-bin/cliRECtM.pl?utesca.

WFDSS GIS 2009. GIS data of Class I air sheds. Internet website: http://wfdss.usgs.gov/wfdss/WFDSS_Data_Downloads.shtml.

Witwicki, Dana. 2013. Climate Monitoring in the Northern Colorado Plateau Network: Annual Report 2011. Natural Resource Technical Report NPS/NCPN/NRTR 2013/664. National Park Service, Fort Collins, Colorado. January 2013.

3.7 Fish and Wildlife

This section describes the existing conditions of fish and wildlife resources in the planning area, including aquatic and terrestrial animal species and their habitats. Although the Utah Division of Wildlife Resources (UDWR), Arizona Game and Fish Department (AGFD), and USFWS are directly responsible for managing fish and wildlife, the BLM is responsible for managing the land; therefore, on the lands it manages in the decision area, the BLM is directly responsible for managing habitat for fish and wildlife species and is indirectly responsible for the health of fish and wildlife that these habitats support. On NPS-managed lands, UDWR and USFWS are not responsible for managing wildlife.

The BLM and NPS follow federal regulations for protecting fish and wildlife, particularly migratory birds. These are the Migratory Bird Treaty Act of 1918, Bald and Golden Eagle Protection Act of 1940, Executive Order 13186, Responsibilities of Federal Agencies to Protect Migratory Birds, and a Memorandum of Understanding to Promote the Conservation of Migratory Birds.

Glen Canyon operates under the NPS management policies (NPS 2006), which delineate principles for plant and animal and genetic resource management. These policies also provide guidance for managing and restoring native plants and animals (NPS 2006, pp. 42-45). The policies state that "as part of the general principles for managing biological resources, the NPS will successfully maintain native plants and animals by:

- "Preserving and restoring the natural abundances, diversities, dynamics, distributions, habitats, and behaviors of native plant and animal populations and the communities and ecosystems in which they occur;
- "Restoring native plant and animal populations in parks when they have been extirpated by past human-caused actions; and
- "Minimizing human impacts on native plants, animals, populations, communities, and ecosystems, and the processes that sustain them" (NPS 2006, p. 42)

In addition, both GSENM and Glen Canyon have existing management responsibilities for fish and wildlife, which is carried forward in this EIS. Relevant management for fish and wildlife from

the GSENM MMP{ XE "Monument Management Plan, Grand Staircase-Escalante National Monument (MMP 2000)" } is as follows (BLM 2000, p. 12):

- FW-2: The BLM will work with the UDWR to meet the requirements of Executive Order 11312 on Invasive Species.
- FW-3: The BLM will continue to work with the UDWR to meet the goals described in adopted species management plans.
- FW-4: The BLM will place a priority on protecting riparian and water resources as they relate to fish and wildlife, and will work cooperatively with the Forest Service to coordinate maintenance of fisheries and flows.
- FW-6: All proposed projects will be required to include a site assessment for impacts on fish and wildlife species. Appropriate strategies will be used to avoid sensitive habitat (i.e., construct barriers).
- FW-7: Water developments may be constructed for wildlife purposes if consistent with the overall objectives for fish and wildlife and with the water development policy.

Relevant management for fish and wildlife in Glen Canyon is described in **Chapter 2**.

Several wildlife resources are identified in the proclamation for GSENM:

> The wildlife of the monument is characterized by a diversity of species. The monument varies greatly in elevation and topography and is in a climatic zone where northern and southern habitat species intermingle. Mountain lion, bear, and desert bighorn sheep roam the monument. Over 200 species of birds, including bald eagles and peregrine falcons, are found within the area. Wildlife, including neotropical birds, concentrate around the Paria and Escalante Rivers and other riparian corridors within the monument.

As discussed above, UDWR and the USFWS are directly responsible for managing fish and wildlife in GSENM, and the Proclamation for GSENM recognizes this in the following:

> Nothing in this proclamation shall be deemed to diminish the responsibility and authority of the State of Utah for management of fish and wildlife, including regulation of hunting and fishing, on Federal lands within the monument.

Wildlife is included in the values and purposes for which Glen Canyon was designated. The value statement for wildlife in Glen Canyon is "The terrestrial and aquatic wildlife resources of Glen Canyon are an integral part of the desert ecosystem to be experienced and enjoyed by visitors to the recreation area. These wildlife resources, which the NPS is charged to protect and preserve for the enjoyment of future generations, have intrinsic and scientific value" (NPS 1999, p. 19).

3.7.1 Current Conditions

The planning area supports a complex and fragile ecosystem, with plants and wildlife that have developed unique adaptations to the arid conditions of their environments. Typical of the Colorado Plateau, the highly diverse vegetation of the planning area creates important habitat for a diverse range of vertebrate animals, including mammals, fish, reptiles and amphibians, birds, and invertebrate species.

Fish and Aquatic Communities

The planning area contains numerous unique ephemeral{ XE "Ephemeral" } and perennial{ XE "Perennial" } aquatic habitats, including streams, alcove pools{ XE "Alcove Pool" }, natural and man-made ponds, springs{ XE "Spring" }, tinajas, and hanging gardens (Vinson 2002, p. 2; Vinson and Dinger 2008, p. 375).

The two river systems in the planning area are the Paria and Escalante. The Paria River is characterized as a warm water system, while the Escalante River drainage has both warm water and cold water habitats. Four native fish species have been identified during past fish inventories (Mueller et al. 1999, p. 16): speckled dace (*Rhinichthys osculus*), flannelmouth sucker (*Castostomus latipinnis*), bluehead sucker (*C. discobolus*), and roundtail chub (*Gila robusta*). Speckled dace was the most abundant native species. Cutthroat trout (*Oncorhynchus clarki*) is present in the Escalante River drainage but is limited to cooler waters upstream of planning area; it has not been identified in the planning area (Fridell et al. 2003).

Eleven nonnative species have been identified (Mueller et al. 1999, p. 16): brown trout (*Salmo trutta*), rainbow trout (*Oncorhynchus mykiss*), brook trout (*Salvelinus fontinalis*), fathead minnow (*Pimephales promelas*), channel catfish (*Ictalurus punctatus*), common carp (*Cyprinus carpio*), red shiner (*Cyprinella lutrensis*), yellow bullhead (*Ameiurus natalis*), striped bass (*Morone saxatilis*), largemouth bass (*Micropterus salmoides*), and green sunfish (*Lepomis cyanellus*).

Aquatic habitats in the planning area also support a diverse assemblage of aquatic invertebrate species (Vinson and Dinger 2008, p. 377). These organisms provide critical food sources for fish. Other habitat components important to healthy aquatic systems are stable riparian conditions, well-vegetated banks, and riparian zones with a multilayered canopy of woody and non-woody riparian vegetation. These features support the maintenance of water temperatures, facilitate dissipation of energy from storm runoff, and provide substrates for fish reproduction.

Wildlife and Habitat

Each species or suite of species in the planning area requires a specific set of habitat conditions to meet their particular needs for survival and reproduction. Different plant community seral stages are also important in providing habitat requirements. As seral stages move from one stage to another, habitats are occupied by different wildlife species. For example, different seral stages of a sagebrush/grassland plant community provide habitat for the nesting and foraging requirements of a number of neotropical and upland birds. Some may require a more open sagebrush canopy with a greater percentage of grasses and forbs in the understory, while others would need a higher percentage of shrub canopy closure for nesting and protection from predators. For these and other reasons, it is usually important to provide for a continuous mosaic pattern of various seral stages of healthy plant communities, composed of native species, across the landscape in order to accommodate the needs of all wildlife.

The importance of habitat connectivity is reinforced by the large body of evidence documenting the effects of habitat fragmentation on wildlife (Trombulak and Frissell 2000; Wilbert et al. 2008; Hebblewhite 2008; Rowland et al. 2004). Such effects include direct removal of habitat, long-term displacement, changes in migration, feeding, courtship, and breeding, and increased movement rates (Hebblewhite 2008, p. 49; Rowland et al. 2004, p. 494; Trombulak and Frissell 2000, p. 20, Wilbert et al. 2008, pp. 3, 4). Effects have been documented in numerous vertebrate and invertebrate species (Trombulak and Frissell 2000; Hebblewhite 2008; Doherty et al. 2008).

In recent surveys of GSENM, 29 species of amphibians and reptiles were documented: one salamander, four anurans (frogs and toads), 13 lizards, and 11 snakes. It is likely that one other species of snake, Smith's black-headed snake (*Tantilla hobartsmithi*), occurs in GSENM, as it was recorded previously (Oliver 2003, p. 3). Ubiquitous and relatively abundant throughout GSENM (Oliver 2003, pp. 5, 9) are the Great Basin spadefoot (*Spea intermontana*), side-blotched lizard (*Uta stansburiana*), tiger whiptail (*Aspidoscelis tigris*), striped whipsnake (*Masticophis taeniatus*), gopher snake (*Pituophis catenifer*), night snake (*Hypsiglena torquata*), and prairie rattlesnake (*Crotalus viridis*). Other species are widespread but patchy or relatively rare and localized in certain areas of GSENM (Oliver 2003, p. 9). Many of these species also occur in Glen Canyon; additional amphibian and reptile species occurring in Glen Canyon are the northern leopard frog (*Lithobates pipiens*), western banded gecko (*Coleonyx variegatus*), Glen Canyon chuckwalla (*Sauromalus obesus*), desert night lizard (*Xantusia vigilis*), and plateau striped whiptail (*Aspidoscelis velox*; Spence 2014).

There are over 350 species of birds in GSENM and Glen Canyon, including bald eagles and peregrine falcons. Neotropical birds concentrate around the Paria and Escalante Rivers and other riparian corridors in the planning area. The planning area is in Bird Conservation Region 16, Southern Rockies/Colorado Plateau (USFWS 2008, p. 18). The 17 Bird Species of Conservation Concern[12] listed in **Table 3-16**, Birds of Conservation Concern, have the potential to occur in the planning area.

A treatment of the mammals of the GSENM region (Flinders et al. 2002) lists 82 confirmed contemporary species (including the big game species discussed below). Rodents are the most represented group; woodrats (*Neotoma* spp.), which are known for their storage and waste structures, called middens, pocket mice (*Perognathus* spp.), and kangaroo rats (*Dipodomys* spp.) are common (NPS 2007). Chipmunks (*Tamias* spp.), pocket gophers (*Thomomys* spp.), and mice (*Peromyscus* spp.) are also common rodents represented in the region. Black-tailed jackrabbit (*Lepus californicus*) and desert cottontail (*Sylvilagus audubonii*) comprise the only rabbit species. Carnivorous mammals include coyote (*Canis latrans*), bobcat (*Lynx rufus*), mountain lion (*Puma concolor*). These species prey on rodents, birds, lizards, domesticated animals, and other large mammals (NPS 2007; Flinders et al. 2002).

---

[12] The USFWS defines Bird Species of Conservation Concern as those "species, subspecies, and populations of all migratory nongame birds that, without additional conservation actions, are likely to become candidates for listing under the Endangered Species Act{ XE "Endangered Species Act (ESA)" } of 1973." These are migratory and non-migratory bird species (beyond those already designated as federally threatened or endangered) that represent the USFWS's highest conservation priorities (USFWS 2008, p. iii).

Fourteen bat species have been observed in GSENM (Flinders et al. 2002) and 18 in Glen Canyon (NPS 2007), including pallid bat (*Antrozous pallidus*), big brown bat (*Eptesicus fuscus*), little brown myotis (*Myotis lucifugus*), fringed myotis (*M. thysanodes*), western pipistrelle (*Pipistrellus hesperus*), and the Brazilian free-tailed bat (*Tadarida brasiliensis*). Bats in GSENM and Glen Canyon include both year-round residents and those observed only during migration. Bats lower their temperature during the day to conserve energy, as they roost alone or in colonies in the cliffs and canyon walls, and emerge at dusk to hunt for insects.

Game animals provide an important recreation and economic benefit through hunting and wildlife viewing. Game populations in the area are desert bighorn sheep, mule deer, pronghorn, elk, upland game birds, mountain lion, and bear. UDWR and AGFD manage wildlife populations and hunting seasons. The planning area is in UDWR game management units 25C/26, Boulder/Kaiparowits Plateau, and 27, Paunsaugunt, and AGFD game management unit 12B.

Table 3-16
Birds of Conservation Concern

Species	Habitat	Likelihood of Occurrence
Bald eagle *Haliaeetus leucocephalus*	Roosts in large trees, often near water	Known to occur, uncommon winter resident
Ferruginous hawk *Buteo regalis*	Cliffs, buttes, creek banks for nesting; farmlands, grassland, and shrub steppe for foraging	Known to occur, uncommon permanent resident
Golden eagle *Aquila chrysaetos*	Nests on cliffs near open country.	Known to occur, common permanent resident
Peregrine falcon *Falco peregrinus*	Cliffs and rock outcrops for nesting, often near pinyon-juniper and ponderosa pine	Known to occur, common permanent resident near cliff habitat
Prairie falcon *F. mexicanus*	Cliffs and rock outcrops for nesting; grassland and shrub steppe for foraging	Known to occur but rare and localized
Flammulated owl *Psiloscops flammeolus*	Old-growth or mature ponderosa pine forest, open mixed-conifer and aspen forests	Known to occur, common summer resident
Burrowing owl *Athene cunicularia*	Associated with prairie dog towns and ground squirrel populations, which provide burrows	Known to occur, uncommon summer resident
Lewis's woodpecker *Melanerpes lewis*	Open, park-like ponderosa pine forests; prefers oak woodlands in winter	Known to occur, but uncommon
Willow flycatcher *Empidonax traillii*	Riparian areas{ XE "Riparian Area" }, primarily willow	Known to occur, uncommon summer migrant
Gray vireo *Vireo vicinior*	Relatively open pinyon-juniper, juniper, or oak woodlands	Known to occur, common summer resident in pinyon-juniper habitat
Pinyon jay *Gymnorhinus cyanocephalus*	Pinyon-juniper woodlands and ponderosa pine forests	Known to occur, common permanent resident
Juniper titmouse *Baeolophus ridgwayi*	Pinyon-juniper woodlands	Known to occur, common permanent resident
Bendire's thrasher *Toxostoma bendirei*	Desert habitats, juniper woodland, agricultural areas, and arid grassland	Known to occur, rare summer resident

Table 3-16
Birds of Conservation Concern

Species	Habitat	Likelihood of Occurrence
Grace's warbler *Setophaga graciae*	Found in high mountain ranges and nests in mature stands of tall ponderosa pine	Known to occur but extremely rare summer resident
Brewer's sparrow *Spizella breweri*	Shrub-steppe, high desert scrub, sagebrush	Known to occur, common summer resident
Cassin's finch *Carpodacus cassinii*	High and mid elevation forests, such as ponderosa pine	Known to occur, common permanent resident

Sources: Sutter et al. 2005; Utah Conservation Data Center 2015; Jensen et al., undated

Desert Bighorn Sheep

Desert bighorn sheep prefer open habitats with steep rocky areas nearby for escape and safety. They primarily graze on grasses and forbs, but their diet may also include shrubs (NatureServe 2015a). In partnership with local conservation groups, the UDWR has reintroduced and supplemented populations of bighorn sheep in Utah since 1973. Since that time, over 850 desert bighorn sheep have been released in areas of historical habitat (UDWR 2013, pp. 5, 20, 21).

The planning area contains habitat for two bighorn sheep populations: Kaiparowits East/West, and Kaiparowits Escalante. In 2014-2015, the combined population estimate for these populations was 730 sheep[13]. Desert bighorn sheep habitat acreages in the planning and decision areas are presented in **Table 3-17**, Bighorn Sheep Habitat in the Planning and Decision Areas, and **Figure 3-11** ~~**Figure 3-11**~~, Desert Bighorn Sheep~~Desert Bighorn Sheep~~.

Table 3-17
Bighorn Sheep Habitat in the Planning and Decision Areas

Bighorn Sheep Habitat	Total Planning Area (Acres)	BLM-Managed Lands (Acres)	NPS-Managed Lands (Acres)
Substantial year-long	8,670	7,500	30
Crucial year-long	780,400	554,100	222,800

Sources: BLM GIS 2014; UDWR GIS 2015

Desert bighorn sheep are managed as a "once-in-a-lifetime" species in Utah, meaning that an applicant can obtain only one hunting permit for the species in the applicant's lifetime. The highest number of desert bighorn sheep tags issued statewide was 54 in 2011 (UDWR 2013, p. 4), and demand for bighorn sheep hunting permits is extremely high (UDWR 2013, p. 5).

Mule Deer

Mule deer use a variety of habitats in Utah and Arizona, usually areas in the early stages of plant succession, where they browse on forbs and grasses (UDWR 2014, pp. 6-7). In winter in the planning area, they use pinyon-juniper, sagebrush, and mixed vegetation cover types, and in the summer they use sagebrush, bitterbrush, snowberry, rabbitbrush, aspen, fir, pine, spruce, wax

[13] Dustin Schaible, UDWR, personal communication via e-mail with Morgan Trieger, EMPSi, October 28, 2016.

currant, curlleaf mountain mahogany, and ponderosa pine (Messmer and Klimack 1999, pp. 14-16). They rely especially on shrubs for forage during critical winter months.

A major challenge to mule deer management in Utah is that many of the UDWR-designated crucial deer ranges are in late successional plant community stages. These areas are dominated by mature stands of pinion-juniper or other conifer trees and old even-aged stands of shrubs, such as sagebrush. This makes them less favorable to mule deer (UDWR 2014, pp. 6-7).

Studies have shown that some mule deer on the Paunsaugunt plateau migrate south into Arizona for winter (Messmer and Klimack 1999, p. 27). An estimated 6,500 mule deer migrate from higher elevations of the Paunsaugunt Plateau and travel up to 30 miles to winter habitats at lower elevation on Buckskin Mountain. A portion of the deer migrate into Arizona where they winter with mule deer that have migrated north from the high elevation Kaibab Plateau.

Figure 3-11 Desert Bighorn Sheep Habitat

Mule deer habitat acreages in the planning and decision areas are presented in **Table 3-18**, Mule Deer Habitat in the Planning and Decision Areas, and Figure 3-12~~Figure 3-12~~, Mule

Table 3-18
Mule Deer Habitat in the Planning and Decision Areas

Mule Deer Habitat	Total Planning Area (Acres)	BLM-Managed Lands (Acres)	NPS-Managed Lands (Acres)
Crucial summer	133,200	126,500	6,500
Substantial summer	31,800	23,600	0
Crucial winter	916,300	883,000	7,100
Substantial winter	264,300	235,500	0
Substantial year-long	19,100	18,400	0

Sources: BLM GIS 2014; UDWR GIS 2015

Pronghorn

In the planning area, pronghorn populations use shrub-steppe habitat, characterized by large expanses of open, low rolling or flat terrain (UDWR 2009, p. 4). Lactating females rely on succulent forbs in the spring{ XE "Spring" } and early summer and need high quality browse above the snow level in winter (UDWR 2009, p. 4).

Management programs for pronghorn in Utah have included transplants, aerial surveys, population classification, harvest management, and limited research. The current statewide pronghorn population is estimated at 12,000 to 14,000 across the state (UDWR 2009).

The planning area contains two known populations of pronghorn. One is in the UDWR Kaiparowits management unit, area near Big Water, and the other is in the Paunsaugunt management unit near the Paria Movie Set. Pronghorn habitat acreages in the planning and decision areas are presented in **Table 3-19**, Pronghorn Habitat in the Planning and Decision Areas, and Figure 3-13~~Figure 3-13~~, Pronghorn Habitat. The Paunsaugunt population occurs outside of mapped habitat depicted on this figure.

Table 3-19
Pronghorn Habitat in the Planning and Decision Areas

Pronghorn Habitat	Total Planning Area (Acres)	BLM-Managed Lands (Acres)	NPS-Managed Lands (Acres)
Crucial year-long	88,800	85,000	0

Sources: BLM GIS 2014; UDWR GIS 2015

Elk

Elk are habitat generalists and have a varied diet which consists of grasses, forbs, and shrubs. This flexible diet allows elk to live in a variety of habitat types, including all of Utah's mountains and some of the low deserts. Elk generally spend their summers at high elevations in aspen and conifer forests, and winters at mid- to low elevation habitats that contain mountain shrub and sagebrush communities (UDWR 2015). Water is an important component of elk habitat; elk on summer range prefer areas within 0.3 mile of water (Jeffrey 1963, in UDWR 2015). Their use of

Figure 3-12 Mule Deer Habitat

Figure 3-13 Pronghorn Habitat

summer range declines markedly beyond 0.5 mile from water (Mackie 1970; Nelson and Burnell 1975 in UDWR 2015).

Unrestricted hunting eliminated most of the elk in Utah by the end of the nineteenth century. Managed hunting, including in the planning area, and large-scale transplant efforts are major reasons for the reestablishment of elk in Utah. Interstate transplants of elk occurred from 1912 to 1925 to reestablish elk to their historical ranges in northern Utah. In addition to the interstate transplant efforts, elk have also been captured and transplanted to and from source herds in Utah. Those transplants were made in the late 1970s and 1980s, mainly on the eastern and southern Utah mountain ranges (UDWR 2015).

Numerous elk have been observed in the Circle Cliffs and Skutumpah Terrace areas of GSENM. Elk habitat acreages in the planning and decision areas are presented in **Table 3-20**, Elk Hab at in the Planning and Decision Areas~~Elk Habitat in the Planning and Decision Areas~~, and **Figure 3-**

Table 3-20
Elk Habitat in the Planning and Decision Areas

Elk Habitat	Total Planning Area (Acres)	BLM-Managed Lands (Acres)	NPS-Managed Lands (Acres)
Substantial summer	11,500	10,800	0
Substantial winter	87,200	84,000	0
Substantial year-long	87,200	73,300	0
Crucial winter	34,000	27,100	0

Sources: BLM GIS 2014; UDWR GIS 2015

Upland Game Birds

UDWR and AFGD manage upland game bird harvest. The most common upland game bird inhabiting the planning area is chukar. They are found on rocky, grassy, or brushy slopes as well as in canyons and drainages. Turkeys are somewhat less common and are found in a variety of habitats, which include woodlands, oak brush, pine groves, canyons, and riparian areas{ XE "Riparian Area" }. Turkeys are concentrated in the Escalante Valley, near Tropic, Henrieville, Cannonville, and Johnson Canyon. These birds feed on a variety of seeds, forbs, insects, fruits, nuts, and acorns. Access to water sources is critical. Additionally, turkeys need roost trees, such as large ponderosa pines or cottonwoods next to foraging areas.

Mountain Lion

Mountain lions use a variety of habitats but generally mountainous or remote undisturbed areas. Their primary food is deer in many areas, though the species is opportunistic, eating various large and small mammals (NatureServe 2015b).

The last statewide estimate of mountain lion populations in Utah was in 1999 and estimated between approximately 2,500 and 4,000 (UDWR and CAG 2015, p. 13). The planning area is mostly in the Colorado Plateau Management Area for mountain lions, though the northern portion of the planning area is in the Southern Mountains Management Area (UDWR and CAG 2015, p. 5). The population estimate in the planning area is unknown. Mountain lions are rarely

Figure 3-14 Elk Habitat

seen in the planning area but become more common in winter, as they follow migrating deer herds from higher elevations of the Dixie National Forest to wintering grounds on GSENM and the ASFO.

Bear

Black bears inhabit forests and nearby openings and den under fallen trees, in tree cavities, underground, or under dense cover (NatureServe 2015c). Black bears use a variety of foods, both plants and animals, and will change diets seasonally based on available food (UDWR 2011, p. 6). It is unknown how many black bears inhabit the planning area, and sightings in GSENM are extremely rare. The Skutumpah Terrace area, Death Hollow, the Paria and Escalante River canyons, and the Circle Cliffs provide the most suitable habitat in the planning area.

Animal Nuisance Species and Pathogens

There are no domestic sheep or goat allotments in the planning area. These domestic livestock do not graze in the decision area; however, domestic livestock kept within private pastures in towns next to GSENM could transmit disease to wildlife in the planning area should they come in contact with each other.

Parasites and disease, such as respiratory diseases caused by *Pasteurellosis*, are a concern for bighorn sheep in Utah and Arizona and have caused large-scale population declines (UDWR 2013, p. 6). Bacteria in the Pasteurellacae family are associated with respiratory disease, death, and reduced fertility in bighorn sheep. Many mammals, including domestic sheep and goats, are carriers of these bacteria, though the disease may also be transferred between wild bighorn sheep (UDWR 2013, pp. 6-7). The Western Association of Fish and Wildlife Agencies Wild Sheep Working Group has published its *Recommendations for Domestic Sheep and Goat Management in Wild Sheep Habitat* (Wild Sheep Working Group 2012) to reduce the likelihood of impacts from disease transmission.

3.7.2 Trends

Most fish and wildlife species are not monitored thoroughly enough to determine changes in distribution and abundance. However, big game populations and trends are estimated in each species' statewide five-year management plan. Specific trends in the planning area are unknown. As of 2013, the UDWR estimates the population of desert bighorn sheep in Utah to be 2,000, indicating a relatively stable population for the past 10 years (UDWR 2013, p. 4). As of 2015, the statewide population estimate is approximately 2,600 sheep, and UDWR estimates a population of approximately 730 bighorn sheep in the Kaiparowits Management Unit in the planning area[14].

For mule deer, the 2013 post-season statewide population estimate in Utah was 332,900; despite adverse drought and weather in some populations, the statewide deer population has grown at an average rate of 1.6 percent over the past 20 years and is now at a level not seen since 1992 (UDWR 2014, p. 6). Habitat conditions in the Kaiparowits and Paunsaugunt population units in the planning area have been declining; desert conditions, along with limited water distribution, may exacerbate habitat limitations (UDWR 2012a, p. 2, 2012b, p. 2).

[14] Dustin Schaible, UDWR, personal communication via e-mail with Morgan Trieger, EMPSi, October 28, 2016.

The Utah statewide population estimate for pronghorn is 12,000 to 14,000, and efforts are ongoing to reintroduce the species into historic habitats and augment existing populations (UDWR 2009, p. 4). The Kaiparowits population was estimated at 100 in 2008 and was stable. The Paunsaugunt population was estimated at 600 in 2008 and was also stable (UDWR 2009, p. 20); however, the small band of Pausaugunt pronghorn in GSENM is less than 12.

Elk are well established throughout Utah, with the current statewide population estimated at approximately 81,000 (UDWR 2015). From 1975 to 1990, the elk population in Utah grew rapidly from an estimated 18,000 elk to 58,000 elk, largely due to population levels below carrying capacity and the abundance of available habitat. From 1990 to 2005, population growth slowed considerably from expanded harvest management designed to reduce population growth rates (UDWR 2015).

The threat of climate change and its associated impacts is a significant threat faced by fish and wildlife. Warming temperatures, drought, wildfire, and other extreme weather effects are expected to increase in frequency. This will likely contribute to impacts on fish and wildlife and their habitat as climate change continues. The Colorado Plateau REA suggests that the ecoregion{ XE "Ecoregion" } is expected to undergo general warming over the entire region, with as much as a 3.6°F (2°C) increase by 2060 in some locations, particularly in the southern portion of the ecoregion (Bryce et al. 2012, p. 130). Average summer temperatures are expected to increase, but even greater increases are simulated for the winter (Bryce et al. 2012, p. 130).

Vegetation communities expected to have the greatest exposure (i.e., higher probability for change) to climate change are shrublands (especially big sagebrush and blackbrush-Mormon tea communities), riparian vegetation, and pinyon-juniper woodland (Bryce et al. 2012, p. 155).

Insects and disease will play a collateral role to the impacts of climate change in altering the dominance and distribution of various vegetation species (Bryce et al. 2012, p. 155); this will in turn alter the distribution and availability of habitat for fish and wildlife.

See **Section 3.6**, Air Quality and Climate Change, for additional details on climate change in the planning area.

3.7.3 References

BLM (United States Department of the Interior, Bureau of Land Management). 2000. Grand Staircase-Escalante National Monument Management Plan{ XE "Monument Management Plan, Grand Staircase-Escalante National Monument (MMP 2000)" }. February 2000.

BLM GIS. 2014. Base GIS data on file with BLM's eGIS Server, used for calculations or figures to support the MMP{ XE "Monument Management Plan, Grand Staircase-Escalante National Monument (MMP 2000)" }-A. BLM, Grand Staircase Escalante National Monument, Utah.

Bryce, S. A., J. R. Strittholt, B. C. Ward, and D. M. Bachelet. 2012. Colorado Plateau Rapid Ecoregional Assessment Report. Prepared for the United States Department of the Interior, Bureau of Land Management, Denver, Colorado.

Doherty, K. E., D. E. Naugle, B. L. Walker, and J. M. Graham. 2008. "Greater sage-grouse{ XE "Greater Sage-Grouse" } winter habitat selection and energy development." *The Journal of Wildlife Management* 72(1):187-195.Flinders, J. T., D. S. Rogers, J. L. Webber-Alston, and H. A. Barber. 2002. Mammals of the Grand Staircase-Escalante National Monument: A Literature and Museum Survey. Monographs of the Western North American Naturalist 1:1-64.

Fridell, R. A., M. K. Morvilius, and K. K. Wheeler. 2003. Inventory and distribution of fish in the Escalante River and tributaries, Grand Staircase-Escalante National Monument, Utah. Publication Number 04-02. Utah Division of Wildlife Resources, Salt Lake City, Utah. *[Note to BLM: Please provide reference for decision file.]*

Hebblewhite, M. 2008. A Literature Review of the Effects of Energy Development on Ungulates: Implications for Central and Eastern Montana. Report prepared for Montana Fish, Wildlife, and Parks, Miles City.

Jensen, F. C., H. Barber, and S. Hedges. Undated. Field checklist of the birds of Grand Staircase-Escalante National Monument. Internet website: http://www.blm.gov/pgdata/etc/medialib/blm/ut/grand_staircase-escalante/programs/fish___wildlife.Par.87100.File.dat/Field%20Checklist-The%20Birds%20of%20GSENM.pdf.

Messmer, T. A., and P. W. Klimack. 1999. Summer Habitat Use and Migration Movements of the Paunsaugunt Plateau Mule Deer Herd. Final report, submitted to the Arizona Game and Fish Department and Utah Division of Wildlife Resources. June 1999.

Mueller, G., L. Boobar, R. Wydoski, K. Comella, R. Fridell, and Q. Bradwisch. 1999. Aquatic survey of the lower Escalante River, Glen Canyon National Recreation Area, Utah, conducted June 22-26, 1998.

NatureServe. 2015a. NatureServe Explorer comprehensive report on bighorn sheep (*Ovis canadensis*). Internet website: http://explorer.natureserve.org/servlet/NatureServe?sourceTemplate=tabular_report.wmt&loadTemplate=species_RptComprehensive.wmt&selectedReport=RptComprehensive.wmt&summaryView=tabular_report.wmt&elKey=102557&paging=home&save=true&startIndex=1&nextStartIndex=1&reset=false&offPageSelectedElKey=102557&offPageSelectedElType=species&offPageYesNo=true&post_processes=&radiobutton=radiobutton&selectedIndexes=102557&selectedIndexes=102097&selectedIndexes=102585&selectedIndexes=105707&selectedIndexes=100041&selectedIndexes=102472.

______. 2015b. NatureServe Explorer comprehensive report on cougar (*Puma concolor*). Internet website: http://explorer.natureserve.org/servlet/NatureServe?sourceTemplate=tabular_report.wmt&loadTemplate=species_RptComprehensive.wmt&selectedReport=RptComprehensive.wmt&summaryView=tabular_report.wmt&elKey=101637&paging=home&save=true&startIndex=1&nextStartIndex=1&reset=false&offPageSelectedElKey=101637&offPageSelectedElType=species&offPageYesNo=true&post_processes=&radiobutton=radiobutton&selectedIndexes=101637&selectedIndexes=103622&selectedIndexes=777431&selectedIndexes=105973.

______. 2015c. NatureServe Explorer comprehensive report on American black bear (*Ursus americanus*). Internet website: http://explorer.natureserve.org/servlet/NatureServe?sourceTemplate=tabular_report.wmt&loadTemplate=species_RptComprehensive.wmt&selectedReport=RptComprehensive.wmt&summaryView=tabular_report.wmt&elKey=100661&paging=home&save=true&startIndex=1&nextStartIndex=1&reset=false&offPageSelectedElKey=824916&offPageSelectedElType=species&offPageYesNo=true&post_processes=&radiobutton=radiobutton&selectedIndexes=824916&selectedIndexes=100661&selectedIndexes=105261&selectedIndexes=103279&selectedIndexes=105535&selectedIndexes=101746&selectedIndexes=103496&selectedIndexes=102953.

NPS (United States Department of the Interior, National Park Service). 2006. Management Policies. United States Department of the Interior, National Park Service. ISBN 0-16-076874-8.

______. 2007. Checklist of Mammals Found in Glen Canyon National Recreation Area. Internet website: https://www.nps.gov/glca/learn/nature/upload/MammalChecklist.pdf.

Oliver, G. V. 2003. Amphibians and Reptiles of the Grand Staircase-Escalante National Monument Distribution, Abundance, and Taxonomy. Prepared for BLM. February 26, 2003.

Rowland, M. M., M. J. Wisdom, B. K. Johnson, and M. A. Penninger. 2004. "Effects of roads on elk: Implications for management in forested ecosystems." Transactions of the 69th North American Wildlife and Natural Resources Conference, pp. 491-508.

Spence, J. R. 2014. Special-Status Species and Communities of Glen Canyon National Recreation Area. National Park Service, Science & Resource Management Division, Page, Arizona. December 1, 2014.

Sutter, J. V., M. E. Anderson, K. D. Bunnell, M. F. Canning, A. G. Clark, D. E. Dolsen, and F. P. Howe. 2005. Utah Comprehensive Wildlife Conservation Strategy. Utah Division of Wildlife Resources. September 2005.

Trombulak, S. C., and C. A. Frissell. 2000. "Review of ecological effects of roads on terrestrial and aquatic communities." *Conservation Biology* 14(1):18-30.

UDWR (Utah Division of Wildlife Resources). 2009. Utah Pronghorn Statewide Management Plan.

______. 2011. Utah Black Bear Management Plan v. 2.0, 2011-2023. January 2011.

______. 2012a. Deer Herd Unit Management Plan, Deer Herd Unit #26 (Kaiparowits). April 2012.

______. 2012b. Deer Herd Unit Management Plan, Deer Herd Unit #27 (Paunsaugunt). April 2012.

______. 2013. Utah Bighorn Sheep Statewide Management Plan.

______. 2014. Utah Mule Deer Statewide Management Plan.

______. 2015. Utah Statewide Elk Management Plan.

UDWR GIS 2015. GIS data of mammal habitat coverages in Utah. Internet website: http://dwrcdc.nr.utah.gov/ucdc/DownloadGIS/disclaim.htm.

UDWR (Utah Division of Wildlife Resources) and CAG (Utah Division of Wildlife Resources and the Cougar Advisory Group). 2015. Utah Cougar Management Plan V.3, 2015-2025. DWR Publication No 15-28.

USFWS (United States Department of the Interior, Fish and Wildlife Service). 2008. Birds of Conservation Concern 2008. December 2008.

Utah Conservation Data Center. 2015. Species accounts. Internet website: http://dwrcdc.nr.utah.gov/ucdc/.

Vinson, M. 2002. Aquatic Ecosystems and Invertebrates of the Grand Staircase-Escalante National Monument. Annual Report of Activities for 2001. May 2002.

Vinson, M. R., and E. C. Dinger. 2008. "Aquatic invertebrates of the Grand Staircase-Escalante National Monument, Utah." *The Southwestern Naturalist* 53(3):374-384.

Wilbert, M., J. Thomson, and N. Wolff Culver. 2008. Analysis of habitat fragmentation from oil and gas development and its impact on wildlife: a framework for public land management planning. The Wilderness Society, Washington, DC.

Wild Sheep Working Group. 2012. Recommendations for Domestic Sheep and Goat Management in Wild Sheep Habitat. Western Association of Fish and Wildlife Agencies.

3.8 SPECIAL STATUS SPECIES

This section describes the existing conditions of special status species in the planning area. On the lands it manages in the decision area, the BLM is directly responsible for managing habitat for special status species and is indirectly responsible for the health of special status species that these habitats support.

The BLM and NPS follow federal regulations for protecting special status species: the Endangered Species Act{ XE "Endangered Species Act (ESA)" } (ESA), the Bald and Golden Eagle Protection Act, and the Sikes Act.

There are three categories of special status species, as follows:

- Federally listed species under the ESA{ XE "Endangered Species Act (ESA)" }
- Sensitive species, as designated by each State Director, including all documented or suspected federal candidate species, those that are listed as endangered or threatened by Utah and Arizona, and any other species that may be designated by the director

- Glen Canyon Species of Concern, as identified by Glen Canyon (see below)

The BLM manages special status species under the policy established in BLM Manual 6840, in addition to requirements set forth under the ESA{ XE "Endangered Species Act (ESA)" } (BLM 2008). State laws protecting species apply to all BLM programs and actions to the extent that they are consistent with the FLPMA{ XE "Federal Land Policy and Management Act (FLPMA)" }. The FLPMA does not apply to NPS-managed lands. No populations of threatened, endangered, or sensitive species are currently known to occur in the Sink Holes allotment (BLM 2011a); therefore, the remainder of this section pertains only to the Utah portion of the planning area.

The NPS manages special status species under the policy established in the 2006 NPS Management Policies and in accordance with 54 USC, Section 100101(a) et seq. and the ESA{ XE "Endangered Species Act (ESA)" }. The NPS will inventory, monitor, and manage state and locally listed species in a manner similar to its treatment of federally listed species to the greatest extent possible (NPS 2006).

Endangered or threatened species are those that the Secretary of the Interior has officially listed under the ESA{ XE "Endangered Species Act (ESA)" } and for which a final rule has been published in the *Federal Register*. Proposed species are those that the Secretary has officially proposed for listing as endangered or threatened and for which a proposed rule has been published in the *Federal Register*. Candidate species are those that the USFWS has designated as candidates for listing as endangered or threatened and are included on a list published in the *Federal Register*. Candidate status indicates existing information warrants listing the species but that other species have higher priority for listing.

The BLM has two objectives for special status species: to conserve or allow to recover ESA{ XE "Endangered Species Act (ESA)" }-listed species and their habitats so that ESA protections are no longer needed and to initiate conservation measures that reduce or eliminate threats to BLM sensitive species so as to minimize the likelihood of, and need for, listing under the ESA (BLM 2008).

It is the BLM's policy to provide sensitive species with the same level of protection as is provided for candidate species (BLM Manual 6840); that is, to ensure that actions authorized, funded, or carried out do not contribute to the need for the species to become listed. The sensitive species designation is normally used for species that occur on BLM-managed lands for which it has the capability to significantly affect the conservation status of the species through management.

NPS objectives for special status species are to cooperate with the USFWS and other agencies to ensure that its actions comply with the ESA{ XE "Endangered Species Act (ESA)" }. This cooperation is also to undertake active management programs for special status species and habitat, including designated critical habitat (NPS 2006). The NPS has primary jurisdiction and responsibility for wildlife management in Glen Canyon and cooperates with state agencies on shared issues.

Utah State Sensitive Species

The Utah BLM State Director's sensitive species list includes sensitive animal and plant species that the BLM and the UDWR recognize. Many of the sensitive species listed by the BLM overlap with the Utah sensitive species list, but, because the lists are maintained separately, they differ slightly. These lists are subject to periodic updates, and new lists will be incorporated into the MMP{ XE "Monument Management Plan, Grand Staircase-Escalante National Monument (MMP 2000)" } through plan maintenance or amendments. The most recent IM listing Utah BLM state sensitive species is IM UT-2011-037 (BLM 2011b), updated July 27, 2011.

National Park Service Regulations and Policies

NPS-wide regulations and policies, including 54 USC, Section 100101(a) et seq., NPS Management Policies 2006 (NPS 2006), and the NPS Natural Resource Management Reference Manual 77, direct the NPS to provide for the protection of park resources. Under 54 USC, Section 100101(a) et seq. the NPS is directed to conserve "wild life" unimpaired for future generations. This is interpreted to mean that native animal and plant life is to be protected and perpetuated as part of a park unit's natural ecosystem.

The NPS Management Policies 2006 state that the NPS "will maintain as parts of the natural ecosystems of parks all plants and animals native to park ecosystems. The term 'plants and animals' refers to all five of the commonly recognized kingdoms of living things and includes such groups as flowering plants, ferns, mosses, lichens, algae, fungi, bacteria, mammals, birds, reptiles, amphibians, fishes, insects, worms, crustaceans, and microscopic plants or animals" (NPS 2006, p. 42). The NPS will achieve this by the following:

- "Preserving and restoring the natural abundances, diversities, dynamics, distributions, habitats, and behaviors of native plant and animal populations and the communities and ecosystems in which they occur
- "Restoring native plant and animal populations in parks when they have been extirpated by past human-caused actions
- "Minimizing human impacts on native plants, animals, populations, communities, and ecosystems and the processes that sustain them" (NPS 2006, p. 42)

If the NPS determines that an action may affect a federally listed species, it is required to consult with the USFWS. This is to ensure that the action would not jeopardize the species' continued existence or result in the destruction or adverse modification of critical habitat. NPS Management Policies 2006 state that the NPS will survey for, protect, and strive to recover all species native to NPS units that are listed under the ESA{ XE "Endangered Species Act (ESA)" }. It also must conserve listed species and prevent detrimental effects on them and that "[the NPS will] manage state and locally listed species in a manner similar to its treatment of federally listed species to the greatest extent possible" (NPS 2006, p. 45).

The NPS has developed a list of special status species and communities in Glen Canyon (Spence 2014). This list includes not only federally and state-listed endangered and threatened species, but Glen Canyon species of concern. These are "species that may be on state lists or species that are rare in Glen Canyon even though they may be common in nearby locations" (NPS 2014, p. 111).

Existing Management Guidelines in the GSENM MMP{ XE "Monument Management Plan, Grand Staircase-Escalante National Monument (MMP 2000)" }

Existing management guidelines for non-grazing resources and resource uses in GSENM may have bearing on grazing-specific management to be developed as part of this MMP{ XE "Monument Management Plan, Grand Staircase-Escalante National Monument (MMP 2000)" }-A/EIS.

Discussed below are the existing special status species management guidelines that will need to be considered when developing future grazing management direction.

Special Status Plants

Management guideline SSP-4, which provides guidance in the allotment evaluation process with respect to special status species, states the following (BLM 2000, p. 23):

> The allotment evaluation process will address the protection of endangered species, including the incorporation of the latest research and information in the protection of these species, consistent with the BLM-wide grazing permit{ XE "Permit, Grazing" } review process. Section 7 consultation will be conducted for all allotments that may affect listed species.

The existing GSENM management plan contains additional management guidelines for special status plants. While additional guidelines do not specifically mention grazing with respect to special status plant management, these guidelines should be considered when developing a grazing plan for GSENM. Particularly relevant guidelines are SSP-1, which address consultation needs, SSP-6, which address noxious weed{ XE "Noxious Weed" } control in areas with threatened or endangered plants, and SSP-18, which addresses maintenance of instream flows (BLM 2000, pp. 23-25).

Special Status Animals

Management guideline SSA-8, which provides guidance in establishing grazing allotments with respect to special status animals, states the following (BLM 2000, p. 14):

> Livestock grazing allotments will be evaluated, and grazing as it relates to all endangered species will be addressed during this process. Evaluations will incorporate the latest research and information in the protection of species. Section 7 consultation will be conducted for all allotments that may affect listed species during the individual allotment evaluations. This process will provide protection for listed and sensitive species as the evaluation will be site specific for each of the allotments.

Additional relevant guidelines are as follows (BLM 2000, p. 13-14):

- SSA-1, which addresses authorized actions and special status animals,
- SSA-2, which addresses consultation needs when activities are proposed in areas with listed or candidate species
- SSA-5, which addresses vegetation restoration in special status species habitat

- SSA-6, which address noxious weed{ XE "Noxious Weed" } control
- SSA-9, which addresses maintenance of stream flows and riparian vegetation

State of Utah Regulations

UDWR Administrative Rule R657-48 establishes the Wildlife Species of Concern and Habitat Designation Advisory Committee. It defines the Utah Sensitive Species List and the procedure for designating wildlife species of concern. Wildlife species that are federally listed or are candidates for federal listing or for which a conservation agreement is in place automatically qualify for the Utah Sensitive Species List.

Kane County General Plan and Resource Management Plan

The Kane County General Plan recognizes that many animals in the county are "designated by the State or Federal Government as having some level of risk" (Kane County 2013, p. 23). The County's goal with respect to special status species is to "avoid Federal intervention in the conservation and promotion of at risk species and habitats." As such, the county will work toward species and habitat conservation as necessary. However, no specific management direction is described in the plan with respect to special status species.

The Kane County Resource Management Plan (Kane County 2015) provides additional wildlife management guidelines that have bearing on special status species. The plan states that Kane County will consult with the UDWR, all affected landowners, lessees, and permittees in developing the following (Kane County 2015):

- Specific wildlife population targets
- Harvest guidelines
- Depredation mitigation
- Guidelines for future site-specific management plans affecting upland, waterfowl, and big game habitat

Additionally, the plan states that Kane County will continue to oppose any listing of a threatened or endangered species that does not include an analysis of the impacts on the County's economic base (Kane County 2015, p. 97).

Garfield County General Plan

The Garfield County General Plan was adopted in 1995 and amended in 1998 to incorporate the GSENM Proclamation (Garfield County 1995). Management direction for special status species is not included in the plan.

3.8.1 Current Conditions

In a letter to the BLM dated X, the USFWS included a list of species and critical habitat that have been documented in or may be found in the planning area. *[note: update as consultation moves forward. BLM conducting consultation]* The BLM biologists reviewed this list and narrowed it down to special-status species that are present or have the potential to be present in the planning area. The biologists narrowed the list further to those species that could be affected by the actions proposed in the alternatives presented under this MMP{ XE "Monument

Management Plan, Grand Staircase-Escalante National Monument (MMP 2000)" }-A/EIS. These species are listed in **Table 3-21**, Federal Listed Species and Critical Habitat Documented in or Potentially Occurring in the Planning Area~~Federal Listed Species and Critical Habitat~~

BLM biologists reviewed and narrowed down the Utah BLM Sensitive Species List (BLM 2011b) to species in or with potential to occur in the planning area[15]. The NPS also provided a list of special status species with potential to be affected by the plan in Glen Canyon[16].

Table 3-21
Federal Listed Species and Critical Habitat Documented in or Potentially Occurring in the Planning Area

Species	Common name	Federal Status	BLM Status	Glen Canyon Status	State Status
Plants					
Asclepias welshii	Welsh's milkweed	T	SS		
Carex specuicola	Navajo sedge	T	SS	N1	
Cycladenia humilis var. jonesii	Jones's cycladenia	T	SS	N2	
Physaria tumulosa	Kodachrome bladderpod	E	SS		
Pediocactus sileri (=Echinocactus s., Utahia s.)	Siler pincushion cactus	T	SS		
Spiranthes diluvialis	Ute ladies'-tresses	T	SS		
Birds					
Empidonax trailii extimus	Southwestern willow flycatcher	E	SS	N1	FE
Coccyzus americanus	Yellow-billed cuckoo	T	SS	N1	FC[1]
Gymnogyps californianus	California condor	Exp[2]	Exp	Exp	Exp
Strix occidentalis lucida	Mexican spotted owl	T	SS	N1	FT
Fishes					
Gila cypha	Humpback chub	E	SS	NX	FE
G. elegans	Bonytail chub	E	SS	NX	FE
Ptychocheilus lucius	Colorado pikeminnow	E	SS	N1	FE
Xyrauchen texanus	Razorback sucker	E	SS	N1	FE

Sources: USFWS 2013a; *[Note to BLM: will update with USFWS consultation letter when available. This ref from T&E species lists available online, by county]* Cameron McQuivey, BLM, personal communication with Morgan Trieger, EMPSi, January 29, 2015; John Spence, NPS, personal communication via e-mail with Morgan Trieger, EMPSi, January 27, 2015; BLM 2000, 2011; EPA GIS 2015; Spence 2014; UDWR 2011

[1]Yellow-billed cuckoo was listed as federally threatened in 2014; the Utah list has not yet been updated to reflect this change.
[2]California condor must be treated as a listed species under ESA{ XE "Endangered Species Act (ESA)" } Section 10(j) when on NPS-managed lands in the planning area.

Federal status codes: E = Endangered; T = Threatened; C = Candidate; DL = Delisted; Exp = Experimental Population
BLM status code: SS = Sensitive Species; CN = Candidate Species; CA = Conservation Agreement Species

[15] Cameron McQuivey, BLM, personal communication via e-mail with Morgan Trieger, EMPSi, January 29, 2015.
[16] John Spence, NPS, personal communication via e-mail with Morgan Trieger, EMPSi, January 27, 2015

Table 3-21
Federal Listed Species and Critical Habitat Documented in or Potentially Occurring in the Planning Area

Species	Common name	Federal Status	BLM Status	Glen Canyon Status	State Status

Park status codes: N1 = Critically Endangered in Glen Canyon; N2 = Endangered in Glen Canyon; N3 = Threatened in Glen Canyon; NX = Extinct in the Wild in Glen Canyon; ? = Poor understanding in Glen Canyon
State status codes: SC = Species of Concern; FE = Federal Endangered Species; FT = Federal Threatened Species; FC = Federal Candidate Species; CA = Conservation Agreement Species

Additional special status species documented in or with the potential to occur in the planning area were determined by reviewing the existing MMP{ XE "Monument Management Plan, Grand Staircase-Escalante National Monument (MMP 2000)" } (BLM 2000), including the record of consultation with the USFWS (BLM 2000, p. 76-82) conducted in preparation of the MMP.

Federally Threatened, Endangered, Proposed, or Candidate Species

Federally threatened, endangered, proposed, or candidate species in or with the potential to occur in the planning area are included in **Table 3-21**, Federal Listed Species and Critical Habitat Documented in or Potentially Occurring in the Planning Area. Descriptions of species are below the table.

Plants

Welsh's milkweed (*Asclepias welshii*) was listed as threatened with critical habitat designated in 1987 (52 *Federal Register* [FR], 41435-41441). The USFWS prepared a recovery plan in 1992 and began a five-year review in 2011 (76 FR, 35906-35908); this review has not been completed. No critical habitat for Welsh's milkweed is in the planning area, nor has it been observed in the planning area.

Welsh's milkweed is an herbaceous plant in the milkweed family (Asclepiadaceae) that occurs on unconsolidated eolian[17] sands (USFWS 1992, p. 2). The known geographic distribution includes three populations in southern Utah (Kane County) and northern Arizona (Coconino County; USFWS 1992, p. 2). Most individuals are on the Coral Pink Sand Dunes west of Kanab (USFWS 1992, p. 2).

Suitable habitat may be present in the planning area. Welsh's milkweed is found just outside the Clark Bench Allotment on the Navajo Sand Dunes, but suitable habitats have not been found in the Clark Bench area on GSENM lands (BLM 2014). Navajo Sand Dunes are found in the Cockscomb Allotment and may provide habitat for this species (BLM 2014).

Navajo Sedge (*Carex specuicola*) was listed as threatened and critical habitat was designated along in 1985 (50 FR, 19370-19374). The USFWS prepared a recovery plan for Navajo sedge in 1987 (USFWS 1987) and completed a five-year review for the species in 2014 (USFWS 2014a). Navajo sedge has not been observed in the planning area, but it occurs in Glen Canyon, next to the planning area, in hanging garden habitat in Slickhorn Canyon along the San Juan River (NPS 2014, p. 125). No critical habitat for Navajo sedge is in the planning area.

[17] Windblown

Navajo sedge is a grass-like perennial{ XE "Perennial" } in the sedge family (Cyperaceae). This slender plant reaches approximately 10 to 18 inches in height and has pale green leaves clustered near the base. It flowers and sets fruit from spring{ XE "Spring" } through summer, but most reproduction appears to be vegetative[18] (USFWS 1987, p. 3-4). Navajo sedge is an obligate of springs, typically in alcoves associated with often vertical sandstone cliffs at 1,280 to 2,300 feet in elevation (USFWS 2014a, p. 6). It rarely occurs on level terrain. It coexists with other hanging garden species (USFWS 2014a, p. 7), such as monkey flower (*Mimulus eastwoodiae*), giant helleborine (*Epipactis gigantea*), and Bluff City columbine (*Aquilegia micrantha*). Water is vital to the survival of Navajo sedge, so any change in the water table level could have an effect on this species.

Jones's cycladenia (*Cycladenia humilis* var. *jonesii*) was listed as threatened in 1986 (51 FR, 16526-16530). The USFWS prepared a recovery outline in 2008 (USFWS 2008a), but it has prepared no recovery plan. No critical habitat has been designated for this species. Jones's cycladenia occurs in GSENM; ongoing monitoring activities for this species in the planning area are described below.

Jones's cycladenia is an herbaceous perennial{ XE "Perennial" } forb in the dogbane family (Apocynaceae) that grows from four to six inches tall. It generally occurs between 4,390 and 6,000 feet in elevation in plant communities of mixed juniper and desert scrub or wild buckwheat-Mormon tea (USFWS 2008a, p. 2). Jones's cycladenia is rhizomatous[19] and produces pink or rose-colored, trumpet-shaped showers from mid-April to early June (USFWS 2008a, p. 2). It grows only on alluvium of gypsiferous and saline soils on the Chinle, Cutler, and Summerville Formations (USFWS 2008a, p. 2). Populations in GSENM grow on generally steep slopes (35 degrees or more), which are generally inaccessible to livestock.[20]

Jones's cycladenia is known from about 20 populations in the Circle Cliffs region of GSENM and Glen Canyon, comprising approximately 2,000 acres of occupied habitat[21] (BLM GIS 2014). The NPS has monitored the Purple Hills location in the Greater Circle Cliffs region every one to four years between 1992 and 2015; demographic data collected included colony health, flowering rates, and fruit and seed output (Spence and Palmquist, in draft). Surveys in 2007 and 2008 showed a 250 percent increase in the number of individuals over the long term (1992 to 2006) mean (J. Spence, pers. comm. 2008 *in* USFWS 2008a, p. 3). Additional yearly monitoring in this region has been conducted from 2008 to 2015; data collected included site location, phenology,[22] and sign of damage (Hughes 2008a, 2009a, 2010a, 2011, 2013a, 2013b; Elliott 2014).

[18] Vegetative reproduction, for Navajo sedge, refers to the fact that most new shoots arise from rhizomes (underground stems), as opposed to germination from seed
[19] Having a long underground stem system that cannot be seen aboveground
[20] Amber Hughes, BLM, personal communication via e-mail with Blake Busse, EMPSi, August 1, 2016.
[21] To estimate acres of occupied Jones's cycladenia habitat, each known point-location occurrence was buffered by a 50-foot radius to capture average estimated individual plant dispersion.
[22] The study of cyclic and seasonal natural phenomena, especially in relation to climate and plant and animal life

One population in Glen Canyon's Middle Moody Canyon, which is on moderate terrain and near a stream channel, may be susceptible to grazing impacts[23].

Kodachrome bladderpod (*Physaria tumulosa*) was listed as endangered in 1993 (58 FR, 52027-52030). The USFWS prepared a recovery outline in 2009 (USFWS 2009), but no recovery plan has been prepared. No critical habitat has been designated for this species. Kodachrome bladderpod occurs in GSENM; ongoing monitoring activities in the planning area are described below.

Kodachrome bladderpod is a perennial{ XE "Perennial" } herbaceous herb in the mustard family (Brassicaceae). It grows on xeric, white, bare shale knolls derived from the Winsor member of the Carmel geologic formation (Welsh and Reveal 1977; Welsh et al. 2003, *in* USFWS 2009 p. 2), at about 5,700 feet elevation (USFWS 2009, p. 2). Kodachrome bladderpod is an endemic plant limited to Kane County, Utah. The species is restricted to one population of scattered occurrences in the Kodachrome Flats area of the Paria River Drainage. Over 90 percent of the species' known range occurs on GSENM, with private landowners and the Kodachrome Basin State Park comprising the remainder (USFWS 2009, p. 2). Approximately 50 acres of occupied habitat for Kodachrome bladderpod occurs in GSENM (BLM GIS 2014).

The Utah Natural Heritage Program conducted the only large-scale survey for Kodachrome bladderpod in 1989 in the Kodachrome Basin, Little Dry Valley, and Rock Springs{ XE "Spring" } Creek areas. The survey documented 20,000 individuals, covering approximately 700 acres (Franklin 1990, in USFWS 2009 p. 3). From 1997 to 2001, monitoring at two study sites in GSENM indicated that the population declined during this four-year period as mortality exceeded recruitment (Van Buren and Harper 2002, in USFWS 2009, p. 3). Mortalities were primarily associated with drought and OHV{ XE "Off-Highway Vehicle (OHV)" } use.

In 2007, 24 new plots were established in GSENM. Ten of these plots were monitored annually from 2008 to 2013 (Hughes 2008b, 2009b, 2010b, 2012, 2013c, and 2013d); observers have identified the numbers of adult, juvenile, and dead plants. The numbers of live plants fluctuated between 494, observed in 2010, and a high of 1,645 plants observed in 2013.

In 2010, the scientific name of the Kodachrome bladderpod was changed from *Lesquerella tumulosa* to its current scientific name of *Physaria tumulosa*.

Siler pincushion cactus (*Pediocactus sileri*) was listed as endangered in 1979 (44 FR, 61786-61788) and subsequently relisted as threatened in 1993 (58 FR, 68476-68480). The USFWS prepared a recovery plan in 1986 (USFWS 1986) and completed a five-year review in 2008 (USFWS 2008b). No critical habitat has been designated for this species. Siler pincushion cactus has not been observed in the planning area, though its geographic range includes portions of southern Utah in Kane and Washington Counties (USFWS 2008b, p. 8).

Siler pincushion cactus grows on gypsiferous clay and sandy soils derived from the Shnabkaib and Middle Red Members of the Moenkopi Formation, between elevations of 2,800 and 5,400

[23] John Spence, NPS, personal communication via e-mail with Morgan Trieger, EMPSi, January 27, 2014

feet in Great Basin desert shrub communities (USFWS 2008b p. 8). Areas of suitable habitat may be present in the planning area.

Ute ladies'-tresses (*Spiranthes diluvialis*) was listed as threatened in 1992 (57 FR, 2048-2050). The USFWS prepared a recovery plan in 1995 (USFWS 1995a) and began a five-year review in 2004 (69 FR, 60605-60607), which it has not yet completed. No critical habitat has been designated for this species.

Ute ladies'-tresses is a perennial{ XE "Perennial" } terrestrial orchid that typically grows in low elevation riparian, spring{ XE "Spring" }, and lakeside wetland{ XE "Wetland" } meadows (USFWS 1999, p. 2 in BLM 2000). A few populations in eastern Utah and Colorado are found in riparian woodlands, but the species seems generally intolerant of shade, preferring open grass, sedge, and forb-dominated sites (USFWS 1999, p. 3 in BLM 2000). The Colorado River Basin populations of Ute ladies'-tresses occur almost exclusively in riparian meadows (USFWS 1999, p. 2 in BLM 2000). Two populations of Ute ladies'-tresses are found in the planning area in Garfield County. One is in riparian meadows along Deer Creek (USFWS 1999, p. 3 in BLM 2000), from the Deer Creek Campground south to the narrows of Deer Spring Canyon (BLM 2014), and the other is in riparian habitat in Henrieville Creek, near the confluence of Shurtz Bush Creek.[24] It is not known to occur in Kane County (USFWS 2013a).

Birds

Yellow-billed cuckoo (*Coccyzus americanus*) was listed as threatened in 2014 (79 FR, 59991-60038). Critical habitat was proposed in 2014 (79 FR 48547-48652), but no final rule has been issued. No critical habitat is proposed in GSENM, and no recovery plan for this species has been prepared.

This medium-sized bird averages 12 inches long, with a slender, long-tailed profile and a fairly stout and slightly down-curved bill (74 FR, 57823). Plumage is grayish brown above and white below (74 FR, 57823). The yellow-billed cuckoo prefers open woodland, with clearings and low, dense, scrubby vegetation. In Utah and Arizona, this species prefers desert riparian woodlands composed of cottonwood, willows, and dense mesquite (*Prosopis* spp.). It typically nests in willows and uses cottonwoods extensively for foraging (Hughes 2015). In addition, dense understory foliage is an important foraging habitat for this bird (74 FR, 57823). It nests on horizontal branches or vertical forks of small trees and large shrubs, averaging 3 to 19 feet above the ground (Hughes 2015).

Yellow-billed cuckoo has not been observed in GSENM, though suitable habitat may exist in riparian habitats. In Glen Canyon, the yellow-billed cuckoo is a rare, restricted transient in dense riverside tamarisk thickets at several locations on the Colorado River and San Juan River (NPS 2014, p. 120).

California condor (*Gymnogyps californianus*) was reintroduced into northern Arizona/southern Utah on October 16, 1996. The USFWS designated this population as nonessential and experimental (BLM 2000, p. 16; 61 FR, 54045-54060). Section 7 consultation

[24] Amber Hughes, BLM, personal communication via email with Blake Busse, EMPSi, August 1, 2016

under the ESA{ XE "Endangered Species Act (ESA)" } was not required for this population of this species when the existing MMP{ XE "Monument Management Plan, Grand Staircase-Escalante National Monument (MMP 2000)" } was prepared; however, both the USFWS and BLM decided it was appropriate and desirable to discuss California condor (BLM 2000, p. 17), so a discussion for California condor is also included in this MMP-A. Additionally, California condors must be treated as a listed species under ESA Section 10(j), when they are on NPS-managed lands in the planning area.

California condors are among the largest flying birds in the world; adults weigh approximately 22 pounds and have a wingspan of up to 9.5 feet (Kiff et al. 1996, p. 1). This species requires suitable habitat for nesting, roosting, and foraging. It nests in cliff cavities, large rock outcrops, or large trees. A single egg is normally laid between late January and early April, and it hatches after approximately 56 days (Kiff et al. 1996, p. 2). Roosting sites are often near feeding sites on cliffs or large trees, and foraging generally occurs in grasslands, in chaparral areas, or in oak savannahs (Kiff et al. 1996, p. 6).

The captive-reared birds in the experimental population were released on the nearby Vermilion Cliffs, north of the Grand Canyon and south of the planning area. California condor have been sighted in GSENM, and they are a rare, local permanent resident in Glen Canyon (NPS 2014, p. 61); however, none have nested in the planning area. In Glen Canyon, most occurrences of this species have been below the dam at Navajo Bridge, Marble Canyon, south of Lees Ferry and the planning area (Spence et al. 2011, p. 36).

Southwestern willow flycatcher (*Empidonax traillii extimus*) was listed as endangered in 1995 (60 FR, 10695-10715). The USFWS prepared a recovery plan in 2002 (USFWS 2002a) and completed the most recent five-year review in 2014 (USFWS 2014b). In March 2016, the USFWS announced 90-day findings on several petitions to reclassify or delist the southwestern willow flycatcher; the agency determined that a status review is warranted (81 FR, 14058-14072). Critical habitat was designated in early 2013 (78 FR, 343-534); approximately 1,100 acres of critical habitat for this species exists within the planning area, along a portion of the Paria River, as depicted in **Figure 3-15**~~**Figure 3-15**~~, Special Status Species Habitat. The the Upper Colorado Recovery Unit (USFWS 2014b, p. 7). The NPS is consulting with the USFWS on southwestern willow flycatcher as part of the Off-Road Vehicle Management Plan/Draft EIS (NPS 2014).

The southwestern willow flycatcher is approximately 5.75 inches long and weighs about 0.42 ounce (USFWS 2002a, p. 4). This small migratory species occupies thickets, scrubby and brushy areas, open second growth, swamps, and open woodland from near sea level to over 8,500 feet elevation; however, it is primarily found in lower-elevation riparian habitats (USFWS 2002a, p. 7). The southwestern willow flycatcher breeds in dense growths of trees and shrubs in riparian ecosystems in the arid southwestern United States, and possibly extreme northwestern Mexico (USFWS 2002a, p. 7). The birds typically arrive on breeding grounds between early May and early June, with the breeding season lasting approximately from mid-June to mid-July (USFWS 2002a, p. 21).

Peterson and O'Neill (1997, pp. 12, 22) found southwestern willow flycatchers in both the Paria and Escalante Rivers riparian corridors but on only several rare occasions. Multiple year surveys

have been completed within suitable or potentially suitable habitat throughout UDWR Southern Region, including on the Paria River (Day 2004, p. 13). In addition, a habitat suitability model has been created and ground tested for potentially occupied habitat in the planning area (Callahan and White 2002). No nesting pairs have been detected through either the surveys or modeling (Peterson and O'Neill 1997, p. 34; Day 2004, p. 13).

The southwestern willow flycatcher formerly bred in Glen Canyon, but currently there are no confirmed nesting or breeding pairs in the area (Spence et al. 2011, p. 50; NPS, undated, p. 29). Two confirmed identifications of the willow flycatcher were made on the Colorado River below the Glen Canyon Dam, and a pair was observed courting in 1997 on the Escalante River (Spence et al. 2011, p. 50; NPS, undated, p. 29). In addition, individuals have been recorded during migration at Clay Hills Crossing and upstream along the San Juan River (Spence et al. 2011, p. 50; NPS, undated, p. 29).

Threats to this species are loss and modification of breeding habitat. Destruction and modification of native riparian habitats have been caused mainly by reducing or removing surface and subsurface water due to diversion and groundwater pumping, changes in flood and fire regimes due to dams and stream channelization, vegetation clearing, and changes in soil and water chemistry due to the disruption of natural hydrologic cycles (USFWS 2002a, p. 33, 2014b).

Invasive species{ XE "Invasive Species" } such as tamarisk (*Tamarix* spp.) have become established and spread due to surface and subsurface water loss in riparian areas{ XE "Riparian Area" } in the region. When the USFWS listed the southwestern willow flycatcher, it identified tamarisk as a threat to the species (60 FR, 10695-

Figure 3-15 Special Status Species Habitat

10715). By the time the recovery plan (USFWS 2002a) was completed, understanding the relationship between tamarisk, water management, and flycatcher use of tamarisk had improved; it is now understood that flycatcher extensively use tamarisk for nesting across their breeding range (USFWS 2014b). Therefore, tamarisk management that primarily removes tamarisk, without addressing the causes for the plant's persistence and reduction of native riparian species, are unlikely to sustain habitat improvement for flycatcher.

Tamarisk leaf beetle (*Diorhabda* spp.), introduced to control the invasive riparian shrub, have expanded into southwestern willow flycatcher breeding range, including in southern Utah, and may further expand throughout the species' breeding range (USFWS 2014b, p. 42). Beetle spread may result in additional habitat loss for southwestern willow flycatcher if native riparian vegetation is not restored in defoliated tamarisk stands.

In addition, reductions in the density and diversity of bird communities, including willow flycatchers, have been associated with livestock grazing (Taylor 1986, p. 257, USFWS 2014b, p. 49) and recreation (Riffell et al. 1996, p. 493; USFWS 2014b, p. 55).

Mexican spotted owl (*Strix occidentalis lucida*) was federally listed as threatened in 1993 (58 FR, 14248-14271), and critical habitat was designated in 2004 (69 FR, 53182-53298), comprising approximately 8.6 million acres of federal lands in Arizona, Colorado, New Mexico, and Utah. The USFWS prepared a revised recovery plan for the Mexican spotted owl in 2012 (USFWS 2012) and completed a short form summary five-year review in 2013 (USFWS 2013b). Approximately 524,100 acres of critical habitat for Mexican spotted owl occurs in the planning area, as depicted in Figure 3-15~~Figure 3-15~~, Special Status Species Habitat. Critical habitat in area is two sections of Unit CP-12, Kaiparowits Plateau. The NPS is consulting with the USFWS on Mexican spotted owl as part of the Off-Road Vehicle Management Plan/Draft EIS (NPS 2014).

GSENM is in the heart of Mexican spotted owl breeding habitat represented by the Colorado Plateau Recovery Unit (Willey 2007, p. 2). Although they are classically associated with late old growth forests, Mexican spotted owls are also widespread in arid canyonland habitats in much of southern Utah and northern Arizona. In GSENM, Mexican spotted owl is strongly associated with steep and complex sandstone canyons dominated by arid vegetation communities rather than mesic old growth forest (Brown 1982 and Thornbury 1965, in Willey 2007, p. 4).

Protected activity centers{ XE "Protected Activity Center (PAC)" } (PACs) are intended to sustain and enhance areas that are presently, recently, or historically occupied by breeding Mexican spotted owls (USFWS 2012, p. 258). There are currently seven PACs in the planning area, as depicted on Figure 3-15~~Figure 3-15~~, Special Status Species Habitat. PACs in the established around known nesting or roosting sites and are intended to protect important activity centers used by owls rather than entire home ranges. They also are intended to protect the nest or primary roost areas and other resources to meet the life-history needs of the owl (USFWS 2012, p. 258).

Surveys for Mexican spotted owl were conducted in GSENM from 2000 to 2006 at nine owl territories (Willey 2007, p. 3). Willey (2007, p. 3) found that owl site occupancy and productivity dropped dramatically during drought years but increased significantly during wetter years. Additional surveys by Willey and Willey (2010) in GSENM showed that, in drought years,

small mammal species' richness and abundance and owl occupancy, number of pairs among sites, and production of young were was much lower than in wet years. Willey and Willey propose that wetter habitats (i.e., mesic sites with consistent springs{ XE "Spring" } and seeps) may experience less fluctuation in small mammal populations between wet and dry years; as a result, these habitats may experience less fluctuation in prey availability and owl occupancy (Willey and Willey 2010).

Hockenbary and Willey (2010, p. 4) conducted occupancy-based population monitoring to estimate occupancy rates of historic territories used by Mexican spotted owl, including in GSENM. During the 2008 field season's occupancy surveys, GSENM had four of nine sites occupied, including three pairs of owls; in 2009, three sites were occupied, including two pairs, and in 2010 three sites were occupied, including one pair (Hockenbary and Willey 2010, p. 9). Owlets were observed in 2008 and 2009 (Hockenbary and Willey 2010, p. 9).

Between 1992 and 1998, portions of Glen Canyon were surveyed for Mexican spotted owls (Spence et al. 2011, p. 24). Surveys found this species in the canyon heads off Big Ridge, Easter Canyon, several Escalante River tributaries, Millard Canyon, and in Miller's Canyon (Wiley 1998, in NPS, undated, p. 25). Recent observations in Glen Canyon show that Mexican spotted owls occupy Scorpion Canyon and Stevens Canyon, and have also been sighted along the Escalante River[25]. In the Grand Bench/Rock Creek-Mudholes area, sightings in September 2014 and an observation in Cave Spring{ XE "Spring" } suggest that there may be breeding in this area[26].

Fishes

Bonytail chub (*Gila elegans*) is listed as endangered under the ESA{ XE "Endangered Species Act (ESA)" }. A recovery plan was approved on September 4, 1990 (USFWS 1990a). The final rule for determination of critical habitat was published on March 21, 1994 (59 FR, 13374), and the final designation became effective on April 20, 1994.

Little is known about the specific habitat requirements of bonytail because the species was extirpated from most of its historic range before extensive fishery surveys. The bonytail is adapted to main stem rivers, where it has been observed in pools and eddies. Similar to other closely related *Gila* species, bonytail in rivers probably spawn in the spring{ XE "Spring" } over rocky substrates. Spawning in reservoirs has been observed over rocky shoals and shorelines. Based on available distribution data, flooded bottomland habitats are likely important growth and conditioning areas for bonytail, particularly as nursery habitats for young (USFWS 2002d).

Until the 1950s, bonytail was historically common or abundant in warm-water reaches of large rivers, from Mexico to Wyoming. It was found far downstream in the main stem Colorado River near the Colorado-Utah border in the Black Rocks area (USFWS 2002d). The last known riverine area where bonytail were common was the Green River in Dinosaur National Monument. Here Vanicek (1967) and Holden and Stalnaker (1970) collected 91 specimens from 1962 to 1966. From 1977 to 1983, no bonytail were collected from the Colorado or Gunnison Rivers in Colorado or Utah. However, in 1984, a single bonytail was collected from Black Rocks

[25] John Spence, NPS, personal communication via e-mail with Morgan Trieger, EMPSi, January 27, 2015
[26] John Spence, NPS, personal communication via e-mail with Morgan Trieger, EMPSi, January 27, 2015

on the Colorado River. Several suspected bonytail were captured in Cataract Canyon between 1985 and 1987.

Humpback chub (*Gila cypha*) is listed as endangered under the ESA{ XE "Endangered Species Act (ESA)" }. It was included on the first List of Endangered Species issued by the Office of Endangered Species on March 11, 1967 (32 FR, 4001), and it was considered endangered under provisions of the Endangered Species Conservation Act of 1969 (16 USC, Subsection 668aa). The humpback chub recovery plan was approved on September 19, 1990 (USFWS 1990b). The final rule for determination of critical habitat was published on March 21, 1994 (59 FR, 13374), and the final designation became effective on April 20, 1994.

The historical distribution of the humpback chub is not well known because it was not described as a species until 1946; however, its original distribution was presumably limited to swift deep-water areas in the main stem Colorado River Basin, downstream to below the Hoover Dam site. Today the largest populations of this species are in the Little Colorado and Colorado Rivers in the Grand Canyon and in the Black Rocks and Westwater Canyon in the upper Colorado River (USFWS 2002e).

Colorado pikeminnow (*Ptychocheilus lucius*) is listed as endangered under the ESA{ XE "Endangered Species Act (ESA)" }. It was included on the first list of endangered species issued by the Office of Endangered Species on March 11, 1967 (32 FR, 4001). The final rule for determining critical habitat was published on March 21, 1994 (USFWS 1994), and the final designation became effective on April 20, 1994. The current revised Colorado pikeminnow recovery plan was approved on August 1, 2002 (USFWS 2002b).

Colorado pikeminnow is restricted to the upper Colorado River Basin. It inhabits warm-water reaches of the Colorado, Green, San Juan, Yampa, and White Rivers and their associated tributaries. Most of Lake Powell is not suitable habitat for Colorado pikeminnow, so it is not designated critical habitat. It requires uninterrupted stream passage for spawning migrations and young dispersal (USFWS 2002b). The species is adapted to a hydrologic cycle characterized by large spring{ XE "Spring" } peaks of snowmelt runoff and low, relatively stable base flows. Throughout most of the year, juvenile, subadult, and adult Colorado pikeminnow use relatively deep, low-velocity eddies, pools, and runs that occur in nearshore areas of main river channels. In the spring, Colorado pikeminnow adults use floodplain habitats, flooded tributary mouths, flooded side canyons, and eddies that are available only during high flows. River reaches of high habitat complexity appear to be preferred. Young pikeminnow feed on insects and plankton, and adults feed on other fishes (USWFS 2002b).

Colorado pikeminnow found in the Colorado River system were more prevalent before the construction of Glen Canyon Dam (BLM 2000, p. 14). There are no known records in GSENM, and recent surveys have not located this species in the Escalante River (BLM 2000, p. 14).

Razorback sucker (*Xyrauchen texanu*) is listed as endangered under the ESA{ XE "Endangered Species Act (ESA)" }, under a final rule published on October 23, 1991 (56 FR, 54957). A recovery plan was approved on August 1, 2002 (USFWS 2002c); a previous recovery plan was dated December 23, 1998 (USFWS 1998). The final rule for determination of critical

habitat was published on March 21, 1994 (USFWS 1994), and the final designation became effective on April 20, 1994.

Historically, razorback suckers were found in the main stem Colorado River and in its major tributaries in Arizona, California, Colorado, Nevada, New Mexico, Utah, Wyoming, and Mexico. In the upper Colorado River Basin, above Glen Canyon Dam, razorback suckers are found in limited numbers in both lentic{ XE "Lentic" } (lake-like) and riverine environments. Adult razorback suckers occupy different habitats seasonally. Spring{ XE "Spring" } habitats required by adults in rivers are deep runs, eddies, backwaters, and flooded off-channel environments; summer habitats are runs and pools, often in shallow water associated with submerged sandbars; and winter habitats are low-velocity runs, pools, and eddies. The species spawns in rivers during spring runoff, over bars of cobble, gravel, and sand substrates. Razorback suckers breed in the spring, when flows in riverine environments are high typically. Their diet consists primarily of algae, plant debris, and aquatic insect larvae.

Razorback suckers found in the Colorado River system were more prevalent before the construction of Glen Canyon Dam (BLM 2000, p. 14). There are no known records in GSENM, and recent surveys have not located this species in the Escalante River (BLM 2000, p. 14).

Invertebrates

Kanab ambersnail (*Oxyloma hadeni kanabensis*) was listed as endangered in 1992 (57 FR, 13657-13662). Critical habitat was proposed in 1991 (56 FR, 58020-58025), but no final critical habitat rule has been issued. Members of the genus *Oxyloma* typically inhabit marshes and other wetlands{ XE "Wetland" } watered by springs{ XE "Spring" } and seeps at the base of sandstone or limestone cliffs (Clarke 1991; Spamer and Bogan 1993, in USFWS 2011, p. 11). According to the most recent five-year review for the species (USFWS 2011), Kanab ambersnail occurs in one location in southern Utah, at Three Lakes. The Three Lakes population is in a series of small ponds on private land approximately six miles northwest of Kanab, Utah, in Kanab Creek Canyon (Clarke 1991; USFWS 1995b; Spamer and Bogan 1993, in USFWS 2011, p. 10). Kanab Creek is not hydrologically connected to GSENM nor Glen Canyon. While the current management plan for GSENM includes guidance for Kanab ambersnail (BLM 2000, p. 17), surveys for this species have not detected it in the planning area (Meretsky et al. 2002, p. 309). There are no known records for this snail in the planning area. Therefore, this species is not considered further in this document.

BLM Sensitive Species

BLM sensitive and Utah state rare species are included in **Table 3-22**, BLM and State Sensitive Species Documented in or Potentially Occurring in the Planning Area. For each species, a brief description of its documented or potential presence in the planning area is included.

Greater Sage-Grouse{ *XE "Greater Sage-Grouse"* }

Greater sage-grouse{ XE "Greater Sage-Grouse" } are considered a sagebrush ecosystem obligate species; they rely on sagebrush on a landscape level and on a microhabitat scale. They require large, intact, interconnected expanses of sagebrush shrubland to exist (Connelly et al. 2004; Wisdom et al. 2011). As a landscape-scale species, they move between habitats seasonally, and they generally require contiguous winter, breeding, nesting, and summer habitats to sustain a population (Connelly et al. 2011).

During the spring{ XE "Spring" } breeding season, male greater sage-grouse{ XE "Greater Sage-Grouse" } congregate to perform courtship displays to attract females on areas called leks. Females nest under shrubs with an herbaceous understory, thus providing cover and hiding them from view (Bunnell 2000). Chick survival is

Table 3-22
BLM and State Sensitive Species Documented in or Potentially Occurring in the Planning Area

Species	Common Name	BLM Status	Glen Canyon Status	State Status	Occurrence in Planning Area?
Plants					
Astragalus ampullarius	Gumbo milkvetch	SS			Mixed desert shrub and juniper communities on clay soils of the Chinle and Tropic Shale Formations. In GSENM, occurs on Chinle shale outcrops in Cottonwood and Mollie's Nipple Allotments; suitable habitat in several additional allotments (BLM 2014)
A. striatiflorus	Escarpment milkvetch	SS			Interdune valleys, sandy depressions on ledges, and bars and terraces in stream channels. Occurs in GSENM, Coral Pink Sand Dunes State Park, and on private lands.
Dalea flavescens var. *epica*	Hole-in-the-rock prairie-clover	SS	N2		Sandstone bedrock and sandy areas in blackbrush and mixed desert shrub communities. Not currently known from planning area, though potential habitat exists.
Euphorbia nephradenia	Paria spurge	SS	N1		On clay hills, blow sand, and stabilized dunes, mainly from Tropic Shale and Entrada Formations. In GSENM, observed on Tropic Shale substrates in the Cottonwood Allotment; potential habitat in several additional allotments (BLM 2014). Not observed in Glen Canyon.
Lupinus caudatus var. *cutleri*	Cutler's lupine	SS			Pinyon-juniper woodland. In GSENM, present in the Clark Bench Allotment; suitable habitat in several additional allotments (BLM 2014).
Oenothera murdockii	Chinle evening-primrose	SS			Pinyon-juniper communities on silty clay barrens of the Chinle and possibly Moenkopi Formations. In GSENM, on Chinle shale outcrops in the Cottonwood and Mollie's Nipple Allotments; suitable habitat in several additional allotments (BLM 2014).

Table 3-22
BLM and State Sensitive Species Documented in or Potentially Occurring in the Planning Area

Species	Common Name	BLM Status	Glen Canyon Status	State Status	Occurrence in Planning Area?
Pediomelum epipsilum	Kane breadroot	SS			Pinyon-juniper woodland and desert shrub communities on the Chinle and Moenkopi formations. In GSENM, on Moenkopi-derived soils in the Mollie's Nipple and White Sage Allotments; suitable habitat in additional allotments (BLM 2014).
Phacelia cronquistiana	Cronquist's phacelia	SS			Clay outcrops in pinyon-juniper-sagebrush and ponderosa pine communities. In GSENM, on alluvial soils from the Carmel Formation in the Ford Well Allotment (BLM 2014).
P. pulchella var. *atwoodii*	Atwood's pretty phacelia	SS			In juniper tree litter on Moenkopi and Carmel soils. In GSENM, occurs on outcrops of the Kaiparowits Formation in the Cottonwood, Headwaters, and Mollie's Nipple Allotments; suitable habitat in several additional allotments (BLM 2014)
Salvia columbariae var. *argillacea*	Chinle chia	SS			Sparsely vegetated pinyon-juniper woodlands on fine-textured, saline clay-silts of the Chinle Formation. In GSENM, on barren exposures of Chinle shale in Mollie's Nipple Allotment; suitable habitat in several additional allotments (BLM 2014)
Sphaeralcea grossulariifolia var. *fumariensis*	Smoky Mountain mallow	SS			Grows with matchweed, ephedra, blackbrush, galleta, shadscale and juniper; endemic on the Straight Cliffs, Tropic Shale, and Dakota Formations around Smoky Mountain. In GSENM, on clinker and alluvial deposits in the Last Chance, Nipple Bench, Rock Creek, Upper Warm Creek, and Wiregrass Allotments (BLM 2014).
Thelypodiopsis ambigua var. *erecta*	Kanab thelypody	SS			Pinyon-juniper woodland and desert shrub communities on clay soils derived from purple Chinle shales. In GSENM, on Chinle shale in the Mollie's Nipple Allotment; suitable habitat in several additional allotments (BLM 2014).
Birds					

Table 3-22
BLM and State Sensitive Species Documented in or Potentially Occurring in the Planning Area

Species	Common Name	BLM Status	Glen Canyon Status	State Status	Occurrence in Planning Area?
Accipiter gentiles	Northern goshawk	CA		CA	One confirmed territory in Mud Springs{ XE "Spring" } Canyon; one additional territory in Rock Creek/Mudholes Allotments. Occasional winter sightings in pinyon-juniper habitat in the Mollie's Nipple Allotment.
Aquila chrysaetos	Golden eagle	SS	N3	SC	Permanent resident in GSENM, documented year-round on several grazing allotments (BLM 2014). Uncommon permanent resident and breeder in Glen Canyon (NPS 2014, p. 121).
Athene cunicularia	Burrowing owl	SS	N1	SC	Documented in the Soda, Upper Warm Creek, and Wiregrass Allotments; suitable habitat in the Cottonwood and Coyote Allotments (BLM 2014). Also breeds in Glen Canyon (NPS 2014, p. 121).
Asio flammeus	Short-eared owl	SS		SC	Uncommon permanent resident in GSENM.
Buteo regalis	Ferruginous hawk	SS		SC	Commonly observed during winter raptor surveys; two historic unoccupied nests on West Clark Bench.
Centrocercus urophasianus	Greater sage-grouse{ XE "Greater Sage-Grouse" }	CN		FC	Approximately 10,500 acres of wintering habitat PHMA{ XE "Priority Habitat Management Area (PHMA)" } in the Skutumpah/Glendale Bench area.
Haliaeetus leucocephalus	Bald eagle	SS	N2	SC	Winter resident in the planning area. Forages at wide, shallow bays and side canyons of Lake Powell, including Wahweap, Warm Creek, Halls Creek Bay, and Bullfrog Bay (NPS 2014, p. 110).
Melanerpes lewis	Lewis's woodpecker	SS		SC	Uncommonly observed in pinyon-juniper and oak habitats in GSENM.
Mammals					
Corynorhinus townsendii	Townsend's big-eared bat	SS	N1?	SC	Mist-netted at several locations in GSENM. Also present in Glen Canyon (NPS 2014, p. 107).
Euderma maculatum	Spotted bat	SS	N2	SC	Present in Glen Canyon (NPS 2014, p. 107).
Idionycteris phyllotis	Allen's big-eared bat	SS		SC	Mist-netted at several locations in GSENM.

Table 3-22
BLM and State Sensitive Species Documented in or Potentially Occurring in the Planning Area

Species	Common Name	BLM Status	Glen Canyon Status	State Status	Occurrence in Planning Area?
Lasiurus blossevillii	Western red bat	SS	N1?	SC	Potential habitat in planning area.
Myotis thysanodes	Fringed myotis	SS	N2?	SC	Mist-netted at several locations in GSENM.
Nyctinomops macrotis	Big free-tailed bat	SS	N2	SC	Confirmed at GSENM through mist net capture (BLM 2008).
Amphibians					
Bufo microscaphus	Arizona toad	SS		SC	Very localized at Sheep Creek crossing on Skutumpah Road, where a concrete weir or spillway impounds and creates standing water (Oliver 2003)
Reptiles					
Sauromalus ater	Common chuckwalla	SS		SC	Localized in southern portion of GSENM, along lower Little Valley, Croton, and Last Chance Creek Canyons (Oliver 2003).
Xantusia vigilis	Desert night lizard	SS	N1	SC	Localized between Kelly Grade and Last Chance Creek along the Smoky Mountain Road (Oliver 2003); potentially in Glen Canyon (NPS 2014, p. 118).
Fishes					
Catostomus discobolus	Bluehead sucker	CA	N2	CA	Present in Escalante River.
C. latipinnis	Flannelmouth sucker	CA	N2	CA	Present in Escalante River.
Gila robusta	Roundtail chub	CA	N2?	CA	Present in Escalante River.

Sources: BLM GIS 2015; Amber Hughes, BLM, personal communication via e-mail with Morgan Trieger, EMPSi, September 18, 2015; Cameron McQuivey, BLM, personal communication with Morgan Trieger, EMPSi, January 29, 2015; John Spence, NPS, personal communication via e-mail with Morgan Trieger, EMPSi, January 27, 2015; Utah Native Plant Society 2015, additional references in table

BLM Status Code: SS = Sensitive Species; CN = Candidate Species; CA = Conservation Agreement Species
Park Status Codes: N1 = Critically Endangered in Glen Canyon; N2 = Endangered in Glen Canyon; N3 = Threatened in Glen Canyon; NX = Extinct in the Wild in Glen Canyon; ? = Poor understanding in Glen Canyon
State Status Codes: SC = Species of Concern; FE = Federal Endangered Species; FT = Federal Threatened Species; FC = Federal Candidate Species; CA = Conservation Agreement Species

associated with higher grass and forb understory cover. This is because chicks eat insects for their first three weeks and mostly forbs until they are three months old (Barnett and Crawford 1994; Gregg et al. 1994; Connelly et al. 2004; Casazza et al. 2011, p. 4-9). As the herbaceous understory in sagebrush habitats begins to dry out in midsummer, greater sage-grouse{ XE "Greater Sage-Grouse" } move to where the herbaceous understory is green, including higher elevations or in valleys where succulent forbs are present (Bunnell 2000). In winter, they rely almost entirely on sagebrush for food and thermal cover. They congregate at lower elevations, where sagebrush habitat is available above snow (Crawford et al. 2004; Schroeder et al. 1999).

There are approximately 10,500 acres of greater sage-grouse{ XE "Greater Sage-Grouse" } Priority Habitat Management Area{ XE "Priority Habitat Management Area (PHMA)" } (PHMA) in the Skutumpah/Glendale Bench of the planning area. PHMAs are areas identified as having the highest conservation value for maintaining sustainable greater sage-grouse populations. PHMA in the planning area is comprised of the far southern portion of the Panguitch population area, and it is identified as wintering habitat (BLM and Forest Service 2015; see Maps 1.1 and 1.2). Habitat in the Panguitch population area is experiencing localized threats of habitat loss from pinyon-juniper encroachment. Greater sage-grouse habitat acreages in the planning area and decision area are presented in **Table 3-23**, Greater Sage-Grouse{ XE "Greater Sage-Grouse" } Habitat in the Planning and Decision Areas~~Greater Sage-Grouse{ XE "Greater Sage-Grouse" } Habitat in~~ Grouse" } Habitat~~Greater Sage-Grouse{ XE "Greater Sage-Grouse" } Habitat~~.

Figure 3-16 Greater Sage-Grouse{ XE "Greater Sage-Grouse" } Habitat

1

Table 3-23
Greater Sage-Grouse{ XE "Greater Sage-Grouse" } Habitat in the Planning and Decision Areas

Greater Sage-Grouse{ XE "Greater Sage-Grouse" } Habitat	Total Planning Area (Acres)	BLM-Managed Lands (Acres)	NPS-Managed Lands (Acres)
PHMA{ XE "Priority Habitat Management Area (PHMA)" }	10,500	10,200	0

Source: BLM GIS 2014, 2015

NPS Sensitive Species

To minimize repetition, those species that are both BLM and NPS sensitive are not described twice; they are described above under BLM sensitive species. NPS sensitive species are summarized in **Table 3-24**, NPS Sensitive Species Documented in or Potentially Occurring in the Planning Area.

Table 3-24
NPS Sensitive Species Documented in or Potentially Occurring in the Planning Area

Species	Common name	Glen Canyon Status	Occurrence in Planning Area?
Plants			
Cymopterus higginsii	Higgins's biscuitroot	N1	Common but patchy on Tropic Shale in Glen Canyon.
Dodecatheon pulchellum var. *zionense*	Zion shooting star	N2	Seeps and hanging gardens. Found in Last Chance Creek springs.{ XE "Spring" }
Heliomeris soliceps	Tropic goldeneye	N2	Present on Tropic Shale outcrops in GSENM (BLM 2014) and Glen Canyon (NPS 2014, p. 127).
Phacelia howelliana	Howell's phacelia	N2	Salt and warm desert shrub and pinyon-juniper communities on clay and basalt hills. Rare on Tropic Shale in Glen Canyon (NPS 2014, p. 127).
P. mammillariensis	Nipple phacelia	N1	Rare on Tropic Shale in Glen Canyon (NPS 2014, p. 127).
Sisyrinchium demissum	Blue-eyed grass	N1	Known only from East End Spring.{ XE "Spring" }
Birds			
Empidonax oberholseri	Dusky flycatcher	N2	In maple-oak stands at Navajo Point.
Falco peregrinus	Peregrine falcon	N3	Commonly observed in multiple grazing allotments (BLM 2014). Relatively common around Lake Powell and along the major rivers, occupying 80 to 90 percent of known nests each year (NPS 2008).
Oreothlypis celata	Orange-crowned warbler	N1	In maple-oak stands at Navajo Point.
Oreoscoptes montanus	Sage thrasher	N2	Rare in sagebrush stands at Navajo Point.
Pipilo chlorurus	Green-tailed towhee	N2	Rare in sagebrush stands at Navajo Point.

Table 3-24
NPS Sensitive Species Documented in or Potentially Occurring in the Planning Area

Species	Common name	Glen Canyon Status	Occurrence in Planning Area?
Spizella atrogularis	Black-chinned sparrow	N1	Rare and local at Navajo Point.
S. breweri	Brewer's sparrow	N2	Occurs in sandsage areas; most common at Navajo Point in Glen Canyon.
Toxostoma crissale	Crissal thrasher	N1	Recent sightings on Grand Bench in Glen Canyon.
Vireo vicinior	Gray vireo	N3	Uncommon and local at Navajo Point.
Mammals			
Ovis Canadensis nelson	Desert bighorn sheep	N3	Permanent residents in Last Chance and Rock Creek-Mudholes Allotments; suitable habitat present in many allotments in the planning area (BLM 2014). Present in Glen Canyon (NPS 2014, p. 116).
Reptiles			
Aspidoscelis velox	Plateau striped whiptail	N1	Formerly found on Navajo Point but potentially extirpated due to grassland conversion.

Sources: John Spence, NPS, personal communication via e-mail with Morgan Trieger, EMPSi, January 27, 2015; Utah Native Plant Society 2015, additional references in table

Park Status Codes: N1 = Critically Endangered in Glen Canyon; N2 = Endangered in Glen Canyon; N3 = Threatened in Glen Canyon; NX = Extinct in the Wild in Glen Canyon; ? = Poor understanding in Glen Canyon

3.8.2 Trends

Few data exist to determine trends for special status fish species in GSENM. Surveys of fish species richness in the Escalante River in Glen Canyon and what was to become GSENM in the 1970s commonly found both native and introduced fish species (Holden and Irvine 1975; McAda et al. 1977, in BLM 2008). More recent inventories in GSENM identified four native, special status fish species: speckled dace, flannelmouth sucker, bluehead sucker, and roundtail chub (Fridell et al. 2003, in BLM 2008).

Properly functioning riparian conditions in good ecological condition are necessary to maintain quality fish habitat; the amount of properly functioning riparian and wetland{ XE "Wetland" } habitat may be used as a rough proxy for the current condition and trends of special status fish habitat in GSENM. Riparian PFC assessments completed in GSENM between 2000 and 2013 show that 48 percent of lentic{ XE "Lentic" } sites were in PFC, and an additional 16 percent were FAR, with an upward trend toward PFC. Thirty-one percent of lentic sites were FAR, with a downward trend or no apparent trend, and 5 percent were nonfunctional. Of lotic{ XE "Lotic" } sites, 49 percent were in PFC, 17 percent were FAR with an upward trend, 24 percent were FAR with no apparent or a downward trend, and 10 percent were nonfunctional (BLM 2015). These data suggest that most riparian and wetland sites assessed are in functioning condition or are moving toward functioning condition and likely contribute to the maintenance of special status fish habitat in GSENM.

This trend is in contrast to wider regional and statewide trends for special status fish. Special status fish species populations have generally been declining throughout Utah. The downward trend is largely due to habitat degradation and loss of habitat complexity caused by erosion, riparian vegetation removal, and channelization (UDWR 2011). Additionally, increased drought, stream dewatering, and fish barriers pose substantial threats to sensitive aquatic species recovery and contribute to declining numbers. Nonnative predation on and resource competition with special status fish species also threaten native aquatic populations throughout Utah.

The Colorado Plateau REA modeled near-term (2025) aquatic habitat intactness in the Colorado Plateau ecoregion{ XE "Ecoregion" }, which includes the planning area. Modeled habitat intactness for aquatic species, including razorback and flannelmouth sucker and Colorado cutthroat trout, declined from low to very low (Bryce et al. 2012, p. 121), indicating declining trends for these species.

Trends for two federally listed bird species in GSENM may also be closely tied to the condition of the riparian system in the planning area. The southwestern willow flycatcher and western yellow-billed cuckoo both rely on dense riparian systems at critical stages of their life cycles (USFWS 2002a; UDWR 2011). Critical habitat for southwestern willow flycatcher in the planning area exists along the Paria River, and nonbreeding individuals have been observed in riparian areas{ XE "Riparian Area" } in both the Paria and Escalante River corridors. Potentially suitable habitat for western yellow-billed cuckoo may be present in the planning area in riparian habitats. This species has been observed in dense riverside tamarisk thickets at several locations on the Colorado and San Juan Rivers (NPS 2014, p. 120). However, this species has not been observed in GSENM. Improving riparian habitat in GSENM would improve potential breeding habitat for these species in the planning area.

Several breeding pairs of Mexican spotted owl have been observed over multiple years in GSENM (Willey 2007, p. 3; Hockenbary and Willey 2010, p. 9). Critical habitat exists in the planning area, and nesting territories are also protected by seven federally designated PACs{ XE "Protected Activity Center (PAC)" }, a component of the species' recovery plan (USFWS 2012). Population trends across the species' range remain unclear, due to few data on populations or occupancy rates (USFWS 2012, p. 30); similarly, conclusions cannot be drawn from the limited data available in the planning area.

Regional habitat intactness can be used to gauge trends for terrestrial special status wildlife species. The Colorado Plateau REA modeled near-term (2025) terrestrial habitat intactness. Results indicate relatively small changes in the negative direction (i.e., lower habitat intactness). According to the REA near-term (2025) terrestrial habitat intactness model, greater sage-grouse{ XE "Greater Sage-Grouse" } showed the most notable declines in habitat quality of all the bird species, due to development projected in the ecoregion{ XE "Ecoregion" } (Bryce et al. 2012, p. 121). Because development density is much lower in the planning area, habitat declines there for greater sage-grouse would be less notable than modeled in the REA. Other bird species, including Mexican spotted owl, golden eagle, burrowing owl, and peregrine falcon, all currently have a wider range of more intact habitat classes (Bryce et al. 2012, p. 121). These

species showed consistent declines in higher quality habitat intactness, with matching increases in lower quality habitat intactness in the near-term (2025; Bryce et al. 2012, p. 121).

Utah is rich in native flora and is remarkable for its large numbers of endemic and rare plants, which is attributed to the state's diverse range of habitats (UDWR 1998, pp. 3, 4). Monitoring for three federally listed plant species in GSENM indicates that trends for individual species range from relatively stable to declining. A range of threats, including habitat degradation from grazing, trampling, OHV{ XE "Off-Highway Vehicle (OHV)" } use, weed spread, and pinyon-juniper encroachment, may affect individual species in different ways. However, the threat of climate change and its associated precipitation, wildfire, and herbivory effects may be the most significant threat faced by the species. Little information is available documenting the current trends, habitat conditions, and population size of most special status plant populations throughout the state (UDWR 2005).

As mentioned above, droughts pose a substantial threat to vegetation, fish, and wildlife, including special status species. Warming temperatures, drought, and other extreme weather effects are expected to increase in frequency and will likely contribute to impacts on special status plant and animal species and their habitat as climate change continues. The NPS has collected trend data on some rare plant species in the planning area that show declines attributed to ongoing drought conditions.

The Colorado Plateau REA suggests that that the ecoregion{ XE "Ecoregion" } is expected to undergo general warming over the entire region, with as much as a 3.6-°F (2 °C) increase by 2060 in some locations, particularly in the southern portion of the ecoregion (Bryce et al. 2012, p. 130). Average summer temperatures are expected to increase, but even greater increases are simulated for the winter (Bryce et al. 2012, p. 130). Vegetation communities expected to have the greatest exposure (i.e., higher probability for change) to climate change are shrublands (especially big sagebrush and blackbrush-Mormon tea communities), riparian vegetation, and pinyon-juniper woodland (Bryce et al. 2012, p. 155). Insects and disease will play a collateral role with the effects of climate change in altering the dominance and distribution of various vegetation species (Bryce et al. 2012, p. 155), which will in turn alter the distribution and availability of habitat for special status species.

See **Section 3.6**, Air Quality and Climate Change, for additional details on climate change in the planning area.

3.8.3 References

Barnett, J. K., and J. A. Crawford. 1994. "Pre-laying nutrition of sage grouse hens in Oregon." *Journal of Range Management* 47:114-118.

BLM (United States Department of the Interior, Bureau of Land Management). 2000. Grand Staircase-Escalante National Monument Management Plan{ XE "Monument Management Plan, Grand Staircase-Escalante National Monument (MMP 2000)" } and Record of Decision. BLM, Grand Staircase-Escalante National Monument, Cedar City, Utah. February 2000.

______. 2008. Grand Staircase-Escalante National Monument Draft Monument Management Plan{ XE "Monument Management Plan, Grand Staircase-Escalante National Monument (MMP 2000)" } Amendment & Draft Rangeland Health{ XE "Rangeland Health" } Environmental Impact Statement. BLM Grand Staircase-Escalante National Monument, Kanab, Utah. October 2008.

______. 2011a. Instruction Memorandum No. 2011-005. Subject: Updated Bureau of Land Management (BLM) Sensitive Species List for Arizona. December 22, 2010.

______. 2011b. Instruction Memorandum No. 2011-037. Subject: Updated Bureau of Land Management (BLM) Sensitive Species Lists for Utah. April 18, 2011.

______. 2014. Allotment Description Summaries. On file at BLM, Grand Staircase-Escalante National Monument, Kanab, Utah. Updated April 2014.

______. 2015. Analysis of the Management Situation. Grand Staircase-Escalante National Monument, Livestock Grazing Plan Amendment and Environmental Impact Statement. July 2015.

BLM GIS. 2014. Base GIS data on file with BLM's eGIS Server, used for calculations or figures to support the MMP{ XE "Monument Management Plan, Grand Staircase-Escalante National Monument (MMP 2000)" }-A. BLM, Grand Staircase Escalante National Monument, Utah.

______. 2015. Sage-grouse priority and general habitat data. BLM, Utah. Internet website: http://www.blm.gov/ut/st/en/prog/planning/SG_RMP_rev/FEIS.html.

BLM and Forest Service. 2015. Utah Greater Sage-Grouse{ XE "Greater Sage-Grouse" } Proposed Land Use Plan Amendment and Final Environmental Impact Statement. US Department of the Interior, BLM, and US Department of Agriculture, Forest Service. June 2015.

Bryce, S. A., J. R. Strittholt, B. C. Ward, and D. M. Bachelet. 2012. Colorado Plateau Rapid Ecoregional Assessment Report. Prepared for the United States Department of the Interior, Bureau of Land Management, Denver, Colorado.

Bunnell, K. D. 2000. "Ecological factors limiting sage-grouse recovery and expansion in Strawberry Valley, Utah." Master's thesis, Brigham Young University, Provo, Utah.

Callahan, D., and L. White. 2002. Willow Flycatcher Habitat Suitability Model Phase I, Grand Staircase-Escalante National Monument, Utah. Bureau of Reclamation. Technical Service Center. Denver, Colorado. *[Note to BLM: Please provide reference for decision file.]*

Casazza, M. L., P. S. Coates, and C. T. Overton. 2011. "Linking habitat selection and brood success in greater sage-grouse{ XE "Greater Sage-Grouse" }." *In:* Ecology, Conservation, and Management of Grouse (B. K. Sandercock, K. Martin, and G. Segelbacher, editors). *Studies in Avian Biology* 39:151-167. University of California Press, Berkeley.

Clarke, A. H. 1991. *Status survey of selected land and freshwater gastropods in Utah*. Unpublished report prepared for the United States Fish and Wildlife Service, Denver, Colorado.

Connelly, J. W., S. T. Knick, M. A. Schroeder, and S. J. Stiver. 2004. Conservation Assessment of Greater Sage-grouse and Sagebrush Habitats. Western Association of Fish and Wildlife Agencies. Unpublished report. Cheyenne, Wyoming.

Connelly, J. W., E. T. Rinkes, and C. E. Braun. 2011. "Characteristics of greater sage-grouse{ XE "Greater Sage-Grouse" } habitats: A landscape species at micro- and macroscales." In: Greater sage-grouse: Ecology of a landscape species and its habitats (S. T. Knick and J. W. Connelly, editors). Cooper Ornithological Union, University of California Press, Berkeley. Pp. 69- 83.

Crawford, J. A., R. A. Olson, N. E. West, J. C. Mosley, M. A. Schroder, T. D. Whitson, R. F. Miller, et al. 2004. "Ecology and management of sage-grouse and sage-grouse habitat." *Journal of Range Management* 57:2-19.

Day, K. S. 2004. Summary of Southwestern Willow Flycatcher Investigations in Utah Division of Wildlife Resources' Southern Region in 2004. UDWR Publication Number 05-09. November 2004.

Elliott, B. 2014. Subject: *Cycladenia jonesii* 2014 Field Survey Summary. E-mail from Brian Elliott to unknown recipients. May 4, 2014.

EPA GIS (United States Environmental Protection Agency Geographic Information System). 2015. Published GIS data of critical habitat. Internet website: http://ecos.fws.gov/crithab/. Last updated September 11, 2015.

Fridell, R. A., M. K. Morvilius, and K. K. Wheeler. 2003. Inventory and distribution of fish in the Escalante River and tributaries, Grand Staircase-Escalante National Monument, Utah. Publication Number 04-02. Utah Division of Wildlife Resources, Salt Lake City, Utah. *[Note to BLM: Please provide reference for decision file.]*

Garfield County. 1995. Garfield County, Utah, General Plan. Amended 1998.

Gregg, M. A., J. A. Crawford, M. S. Drut, and A. K. DeLong. 1994. "Vegetation cover and predation of sage grouse nests in Oregon." *Journal of Wildlife Management* 58:162-166.

Hockenbary, C., and D. Willey. 2010. Estimating Occupancy Rates, Reproductive Effort and Effects of Recreation on Mexican Spotted Owls in Southern Utah. Annual Progress Report 2010.

Holden, P. B., and J. R. Irvine. 1975. Ecological Survey and Analysis of the Aquatic and Riparian Fauna of Escalante Canyon, Utah. Contract No. CS 12004 B034, Final Report to National Park Service and Cooperative Research Unit, Utah State University, Logan. *[Note to BLM: Please provide reference for decision file.]*

Holden, P. B., and C. B. Stalnaker. 1970. "Systematic studies of the Cyprinid genus *Gila* in the Upper Colorado River Basin." *Copeia* 1970(3):409-420.

Hughes, J. M. 2015. Yellow-billed Cuckoo (*Coccyzus americanus*), The Birds of North America Online (P. G. Rodewald, editor). Ithaca: Cornell Lab of Ornithology. Internet website: http://bna.birds.cornell.edu/bna/species/418.

Hughes, A. 2008a. *Cycladenia humilus* var. *jonesii* Report for 2008. December 9, 2008.

______. 2008b. *Lesquerella tumulosa* Report for 2008. December 9, 2008.

______. 2009a. *Cycladenia humilus* var. *jonesii* Report for 2009. December 29, 2009.

______. 2009b. *Lesquerella tumulosa* Report for 2009. December 29, 2009.

______. 2010a. *Cycladenia humilus* var. *jonesii* Report for 2010. June 16, 2010.

______. 2010b. *Lesquerella tumulosa* Report for 2010. July 15, 2010.

______. 2011. *Cycladenia humilus* var. *jonesii* Report for 2011. December 12, 2011.

______. 2012. *Lesquerella tumulosa* Report for 2011. January 24, 2012.

______. 2013a. *Cycladenia humilus* var. *jonesii* Report for 2012. March 27, 2013.

______. 2013b. *Cycladenia humilus* var. *jonesii* Report for 2013. December 16, 2013.

______. 2013c. *Lesquerella tumulosa* Report for 2012. March 27, 2013.

______. 2013d. *Lesquerella tumulosa* Report for 2013. December 16, 2013.

Kane County. 2013. Kane County, Utah, General Plan. August 2013.

______. 2015. Kane County, Utah, Resource Management Plan. Amended November 2015.

Kiff, L. F., R. I. Mesta, and M. P. Wallace. 1996. Recovery Plan for The California Condor, Third Revision. USFWS, Portland, Oregon. April 1996.

Meretsky, V. J., E. G. North, and L. E. Stevens. 2002. "Kanab ambersnail and other terrestrial snails in south-central Utah." *Western North American Naturalist* 62(3):307-315.

NPS (United States Department of the Interior, National Park Service). 2006. National Park Service Management Policies 2006. United States Department of the Interior, National Park Service. Washington, DC.

______. 2008. Glen Canyon National Recreation Area Birds. Internet website: http://www.nps.gov/glca/naturescience/birds.htm. Last updated October 1, 2008.

______. 2014. Glen Canyon National Recreation Area Off-road Vehicle Management Plan/Draft Environmental Impact Statement. Internet website: http://parkplanning.nps.gov/document.cfm?documentID=56859. January 2014.

______. Undated. Annotated Checklist of the Birds of Glen Canyon National Recreation Area.

Oliver, G. V. 2003. Amphibians and Reptiles of the Grand Staircase-Escalante National Monument Distribution, Abundance, and Taxonomy. Prepared for BLM. February 26, 2003.

Peterson, L. C., and D. M. O'Neill. 1997. Southwestern Willow Flycatcher Occurrence and Habitat in the Escalante River, Kanab Creek, and Paria River Drainages in 1997. UDWR Publication Number 97-12. September 1997.

Riffell, S. K., K. J. Gutzwiller, and S. H. Anderson. 1996. "Does repeated human intrusion cause cumulative declines in avian richness and abundance?" *Ecological Applications* 6(2):492-505.

Schroeder, M. A., J. R. Young, and C. E. Braun. 1999. "Sage grouse (*Centrocercus urophasianus*)." In: *The Birds of North America* (P. G. Rodewald, editor). Ithaca, New York. Internet website: https://birdsna.org/Species-Account/bna/species/saggro/introduction/.

Spence, J. R. 2014. Special-Status Species and Communities of Glen Canyon National Recreation Area. National Park Service, Science & Resource Management Division, Page, Arizona. December 1, 2014.

Spence, J. R., and E. C. Palmquist. In draft. Draft *Cycladenia jonesii* Eastwood (Apocynaceae) in the Circle Cliffs-Escalante Region of South-Central Utah: Status, Distribution, and Monitoring Plan. National Park Service Division of Resource and Management Interpretation, Glen Canyon National Recreation Area. April 12, 2007.

Spence, J. R., C. T. LaRue, and J. D. Grahame. 2011. "Birds of Glen Canyon National Recreation Area, Utah and Arizona." *Monographs of the Western North American Naturalist* 5:20-70.

Taylor, D. M. 1986. "Effects of cattle grazing on passerine birds nesting in riparian habitat." *Journal of Range Management* 39(3):254-258.

USFWS (United States Department of the Interior, Fish and Wildlife Service). 1986. Siler Pincushion Cactus (*Pediocactus sileri*) Recovery Plan. USFWS, Albuquerque, New Mexico.

______. 1987. Navajo Sedge (*Carex specuicola*) Recovery Plan. USFWS, Albuquerque, New Mexico. September 24, 1987.

______. 1990a. Bonytail Chub Revised Recovery Plan. USFWS, Mountain Prairie Region 6, Denver, Colorado. September 4, 1990.

______. 1990b. Humpback Chub Second Revised Recovery Plan. USFWS, Mountain Prairie Region 6, Denver, Colorado. September 19, 1990.

______. 1992. Welsh's Milkweed (*Asclepias welshii*) Recovery Plan. USFWS, Denver, Colorado. September 30, 1992.

______. 1994. Endangered and Threatened Wildlife and Plants; Determination of Critical Habitat for the Colorado River Endangered Fishes: Razorback Sucker, Colorado Squawfish, Humpback Chub, and Bonytail Chub. Final Rule. *Federal Register* 59(54):13374-13400.

______. 1995a. Ute Ladies'-Tresses (*Spiranthes diluvialis*) Agency Review Draft Recovery Plan. USFWS, Denver, Colorado.

______. 1995b. Kanab ambersnail (*Oxyloma haydeni kanabensis*) Recovery Plan. USFWS, Denver, Colorado.

______. 1998. Razorback Sucker (*Xyrauchen texanus*) Recovery Plan. USFWS, Mountain Prairie Region 6, Denver, Colorado. December 23, 1998.

______. 1999. Biological Opinion for the Draft Management Plan for the Grand Staircase-Escalante National Monument (6-Utah-99-F-002). Utah Field Office, Salt Lake City. May 19, 1999. *[Note to BLM: Please provide reference for decision file.]*

______. 2002a. Southwestern Willow Flycatcher Recovery Plan. Albuquerque, New Mexico.

______. 2002b. Colorado Pikeminnow (*Ptychocheilus lucius*) Recovery Goals: Amendment and Supplement to the Colorado Squawfish Recovery Plan. USFWS, Mountain Prairie Region 6, Denver, Colorado. August 1, 2002.

______. 2002c. Razorback Sucker (*Xyrauchen texanus*) Recovery Goals: Amendment and Supplement to the Razorback Sucker Recovery Plan. USFWS, Mountain Prairie Region 6, Denver, Colorado. August 1, 2002.

______. 2002d. Bonytail (*Gila elegans*) Recovery Goals: Amendment and Supplement to the Bonytail Chub Recovery Plan. USFWS, Mountain Prairie Region 6, Denver, Colorado. August 1, 2002.

______. 2002e. Humpback Chub (*Gila cypha*) Recovery Goals: Amendment and Supplement to the Humpback Chub Recovery Plan. USFWS, Mountain Prairie Region 6, Denver, Colorado. August 1, 2002.

______. 2008a. Recovery Outline for the Jones Cycladenia (*Cycladenia humilis* var. *jonesii*). USFWS, Utah Ecological Services. December 2008.

______. 2008b. Siler Pincushion Cactus (*Pediocactus sileri*) 5-Year Review: Summary and Evaluation. USFWS, Arizona Ecological Services Office, Phoenix, Arizona.

______. 2009. Revised Recovery Outline for the Kodachrome bladderpod (*Lesquerella tumulosa*). USFWS, Utah Ecological Services Field Office, West Valley City, Utah. August 2009.

______. 2011. Kanab ambersnail *Oxyloma haydeni kanabensis* 5-Year Review: Summary and Evaluation. USFWS Utah Field Office Ecological Services, West Valley City. July 2011.

______. 2012. Final Recovery Plan for the Mexican Spotted Owl (*Strix occidentalis lucida*), First Revision. Albuquerque, New Mexico.

______. 2013a. County Lists of Utah's Federally Listed Threatened, Endangered, and Candidate Species. Internet website: http://www.fws.gov/utahfieldoffice/endspp.html. Last updated August 1, 2013.

______. 2013b. Mexican spotted owl (*Strix occidentalis lucida*) 5-Year Review Short Form Summary. USFWS Arizona Ecological Services Office, Phoenix. August 2013.

______. 2014a. Navajo sedge (*Carex specuicola*) 5-Year Review: Summary and Evaluation. USFWS Arizona Ecological Services Field Office, Phoenix. August 2014.

______. 2014b. Southwestern Willow Flycatcher (*Empidonax traillii extimus*) 5-Year Review: Summary and Evaluation. USFWS Arizona Ecological Services, Phoenix. August 15, 2014.

UDWR (Utah Department of Natural Resources, Division of Wildlife Resources). 1998. Inventory of Sensitive Species and Ecosystems in Utah. Endemic and Rare Plants of Utah: An Overview of Their Distribution and Status. State of Utah Department of Natural Resources Division of Wildlife Resources. June 1998.

______. 2005. Plant Information Compiled by the Utah Natural Heritage Program: A Progress Report. By M. A. "Ben" Franklin. State of Utah Department of Natural Resources Division of Wildlife Resources. Salt Lake City, Utah. December 2005.

______. 2011. Utah Sensitive Species List. State of Utah Department of Natural Resources Division of Wildlife Resources. March 29, 2011. Internet website: http://dwrcdc.nr.utah.gov/ucdc/ViewReports/SSLAppendices20110329.pdf.

UNPS (Utah Native Plant Society). 2015. Utah Native Plant Society 2003-2015 Utah rare plant guide. A. J. Frates, editor/coordinator. Salt Lake City, Utah: Utah Native Plant Society. Internet website: http://www.utahrareplants.org.

Vanicek, C. D. 1967. "Ecological Studies of Native Green River Fishes Below Flaming Gorge Dam, 1964- 1966." Unpublished doctoral dissertation, Utah State University, Logan.

Welsh, S. L., and J. L. Reveal. 1977. "Utah flora: Brassicaceae (Cruciferae)." *Great Basin Naturalist* 37:279-365.

Willey, D. 2007. Ecology of Small Mammals within Spotted Owl Nest Areas in Grand Staircase-Escalante National Monument, Final Report. March 2007.

Willey, D. W., and H. C. Willey. 2010. Ecology of small mammals within spotted owl nest areas in Grand Staircase-Escalante National Monument. *In*: Learning from the land: Grand Staircase - Escalante National Monument science symposium proc. Kanab, Utah, USA.: United States Department of the Interior, Bureau of Land Management, Grand Staircase-Escalante National Monument and Grand Staircase-Escalante partner. Pp. 463-480. *[Note to BLM: Please provide reference for decision file.]*

Wisdom, M. J., C. W. Meinke, S. T. Knick, and M. A. Schroeder. 2011. "Factors associated with extirpation of sage-grouse." *In* "Greater sage-grouse{ XE "Greater Sage-Grouse" }: Ecology and conservation of a landscape species and its habitats." *Studies in Avian Biology* 38:451-472. University of California Press, Berkeley.

3.9 CULTURAL RESOURCES

Cultural resource is a broad term that encompasses numerous categories of historic properties, sacred Native American sites, and resources of tribal concern. Under the National Historic Preservation Act{ XE "National Historic Preservation Act (NHPA)" } (NHPA), historic properties are defined specifically as sites, buildings, structures, objects, and districts that are included on or that are eligible for inclusion on the National Register of Historic Places{ XE "National Register of Historic Places (NRHP)" } (NRHP). The term cultural resource is not defined in NEPA{ XE "National Environmental Policy Act (NEPA)" }, but it requires agencies to consider the impacts of their actions on all aspects of the human environment, including the cultural environment.

Examples of cultural resources are prehistoric and historic archaeological sites, artifacts, residential and commercial buildings, structures, such as bridges, roads, railroads, irrigation ditches, and historic trails, objects, such as roadside markers, monuments, signs, and sculptures, and historic districts, which may encompass one of more of these resource types in a concentrated, geographically definable area. Cultural resources can be significant in the context of national, regional, or local history, architecture, archaeology, engineering, or culture. They may also include sacred sites and natural features significant to extant communities or peoples.

In general, prehistoric resources are those that predate Euro-American contact and therefore are associated with cultural activities that occurred before European settlement in the New World. Historic resources are those that follow the period of European settlement. This period began with the establishment of Euro-American settlement and thus varies in origination date by specific region. Ethnographic resources are those that are directly associated with the cultural practices and beliefs of living cultures.

Also included under cultural resources are traditional cultural properties{ XE "Traditional Cultural Property (TCP)" } (TCPs), which the NPS defines in National Register Bulletin 38 as "districts, sites, buildings, structures, or objects that are eligible for inclusion in the [NRHP{ XE "National Register of Historic Places (NRHP)" }] because of [their] association with cultural practices or beliefs of a living community that (a) are rooted in that community's history, and (b) are important in maintaining the continuing cultural identity of the community" (Parker and King 1998).

Other federal legislation, such as the Archaeological Resources Protection Act, Native American Graves Protection and Repatriation Act{ XE "Native American Graves Protection and Repatriation Act (NAGPRA)" } of 1990 (NAGPRA), and American Indian Religious Freedom Act{ XE "American Indian Religious Freedom Act (AIRFA)" } of 1978 (AIRFA), also require the federal government to protect various cultural resources. As discussed further under **Section 3.18~~5~~**, Tribal Interests, AIRFA requires the federal government to consider the effects of their actions on resources and practices that may not meet the definition of a historic property under the NHPA{ XE "National Historic Preservation Act (NHPA)" }.

The NPS (1998) provides additional cultural resource categories in its Cultural Resource Management Guidelines, including archaeological resources, cultural landscapes, structures, museum objects, and ethnographic resources. These NPS guidelines also acknowledge the primacy of the NHPA{ XE "National Historic Preservation Act (NHPA)" } and NRHP{ XE "National Register of Historic Places (NRHP)" } in meeting its federal obligations. "Cultural resources" may be used as a broad term, irrespective of their NRHP listing or eligibility; nevertheless, "historic properties," as defined in the NHPA (36 CFR, Part 60) is used when discussing potential adverse effects or other federally mandated management considerations. Further, when comparable classes of cultural resources are discussed, both terms NHPA/NRHP and NPS definitions are used together. The BLM and other federal agencies generally use the definitions for historic properties and NRHP eligibility (36 CFR, Parts 60 and 800) when considering cultural resources on the lands they manage.

This section describes the condition of historic properties in the planning area that may be impacted by grazing management allocations and management actions. The understanding of these historic properties serves as the baseline for analysis, including determining the impacts of the various alternatives on resources. Resource descriptions are depicted only in as much detail as needed to analyze the effects of the proposed actions.

The proclamation establishing GSENM noted various cultural resources and historic properties in the new monument. One such example is prehistoric Anasazi and Fremont (also known as Ancestral Puebloan) culture archaeological sites, such as rock art panels, campsites, and granaries. Other examples are the Dance Hall Rock National Historic Site, which continues in its importance to local ranchers and Mormons to this day, and the route and associated sites from the John Wesley Powell Expedition. Additionally, the proclamation notes the significance of the "early Mormon pioneers [who] left many historic [remains], including trails, inscriptions, ghost towns such as the Old Paria townsite, rock houses, and cowboy line camps, and built and traversed the renowned Hole-in-the-Rock Trail as part of their epic colonization efforts" (Proclamation 6920, GSENM).

Further, the Glen Canyon Foundation Document (NPS 2014) recognizes the role of Glen Canyon as steward in preserving a record of more than 10,000 years of human presence, adaptation, and exploration in the park, as exemplified by archaeological and historic sites, cultural landscapes, and TCPs{ XE "Traditional Cultural Property (TCP)" }. These cultural resources illustrate the connection of people with the landscape of the Glen Canyon region and remain significant places for many descendent communities. They provide opportunities for people to connect with cultural values and associations that are both ancient and contemporary.

NPS Management Policies (2006) and Cultural Resource Management Guidelines (1998) provide broad policy direction for managing cultural resources in units of the National Park System, including for Glen Canyon. The NPS is charged to protect, preserve, and foster appreciation of the cultural resources in its custody and to demonstrate its respect for the peoples traditionally associated with those resources, through appropriate programs of research, planning, and stewardship.

The NPS Cultural Resource Management Guidelines state that cultural resources should be evaluated using the NRHP{ XE "National Register of Historic Places (NRHP)" } criteria and that these resources should be "left undisturbed unless intervention can be justified based on compelling research, interpretation, site protection, or park development needs (NPS 1998)." The goals are to protect and preserve the scientific value associated with prehistoric and historic cultural resources. The NPS (1998) must also consider the impacts of its actions, in accordance with the criteria of adverse effects; these are defined as "direct or indirect alteration of the characteristics that qualify a [historic] property for inclusion in the NRHP in a manner that diminishes integrity of location, design, setting, materials, workmanship, feeling, or association" (36 CFR, Subpart 800.5[a][1]).

The BLM follows the guidance of the NHPA{ XE "National Historic Preservation Act (NHPA)" }, as detailed in BLM Handbook Series 8100, and evaluates cultural resources using the NRHP{ XE "National Register of Historic Places (NRHP)" } criteria. The BLM must also consider the impacts of its actions, in accordance with the criteria of adverse effects, which are described above for the NPS.

A historic property must have integrity in all or some of the seven aforementioned aspects location, design, setting, materials, workmanship, feeling, and association and be listed on, or eligible for listing on, the NRHP{ XE "National Register of Historic Places (NRHP)" } under one or more of the criteria listed below (36 CFR, Part 60; NPS 2002):

- Criterion A Association with events important in local, regional, or national history
- Criterion B Association with lives of important historical persons
- Criterion C Displaying the characteristics of a specific type, period, or method of construction, the work of a master, possessing high artistic value, or being part of an entity whose components lack individual distinction (such as a historic district)
- Criterion D Having yielded, or being likely to yield, information important in prehistory or history

3.9.1 Cultural History

A regional cultural history or chronology establishes the broad trends in the human use of an area through the placement in time of artifact types, sites, or site strata. The development of a chronology is an important research goal and also provides a framework for structuring research and analysis, describing change over time, and synthesizing new information. This broad summary is not based on new original research but relies heavily on previous work on GSENM and adjacent areas documented by Fairley (1989a, 1989b), McFadden (2016), Spangler (2001),

Terlep (2012), and BLM (2008). The tools and information available to describe past environments and interpret the physical remains of the past are limited, but they are always evolving. The timelines of the periods discussed are generalizations, derived from the source documents. Labels and boundary designations assigned by archaeologists to prehistory do not necessarily reflect the actual cultural identities of past societies.

Paleo-Indian Period (10,000 - 5500 BC)

While the human occupation of the Southwest may span up to 13,500 years, archaeological knowledge of the planning area's earliest prehistory remains limited although surface finds have been identified (Geib 1996). The term Paleo-Indian refers to Native Americans who inhabited North America in the Late Pleistocene. The presumed timeline for the Paleo-Indian Period varies, depending on the researcher, but it is generally considered to span from 10,000 BC to 5500 BC. This period represents the first well-documented presence of human populations in North America, although there is growing acceptance of data indicating earlier occupations in other areas. The Paleo-Indian Period is typically divided into three sub-periods, each equated with widespread cultures or complexes Clovis (10,000 to 9000 BC), Folsom (9000 to 8000 BC), and Late Paleo-Indian (8000 to 5500 BC). The Clovis culture represents the earliest, widely accepted occupation of North America, although compelling evidence for a pre-Clovis presence is now beginning to emerge.

The natural environment during the Paleo-Indian Period and the Late Pleistocene/Early Holocene were characterized by environmental change. Glaciers covering much of North America had been retreating in previous millennia. There were great fluctuations in climate and in distributions of plants and animals that are now extinct.

The presumption is that people crossed large expanses of land as highly mobile, nomadic hunter-gatherers, manufacturing and using a sophisticated tool kit for hunting, butchering game, and processing hides and bone. Paleoenvironmental data indicates that the earliest specialized artifacts, such as fluted projectile points, appeared after a period of increased moisture, when there was more surface water in the Southwest than there is today.

Paleo-Indian subsistence focused on Pleistocene megafauna, such as mammoths, camelids, ground sloths, and extinct forms of bison. Traditionally, the Indian adaptation has been characterized as a "focal" or "narrow-spectrum" subsistence economy, centered on big game hunting (Irwin-Williams and Haynes 1970). This portrayal has recently been the subject of debate, as evidence for the exploitation of smaller game and plant resources is increasingly recognized in the Paleo-Indian record. And while subsistence strategies may have included plant processing, most data regarding Paleo-Indian culture and diet come from hunting sites (Fairley 1989a, p. 88).

Paleo-Indian lithic technological organization is typically understood as employing a curated versus expedient behavioral strategy tied to a highly mobile lifestyle (Bamforth 1986; Binford 1979; Nelson 1991). Curated behavior involves conserving high-quality raw material from distant sources in anticipation of future need and preparing materials ahead of time so that time spent in tool manufacturing is minimized. Therefore, tools within curated strategies are easily transported, reliable, and carefully designed to fulfill multiple future tasks. Paleo-Indian

lithic toolkits generally consist of distinctive lanceolate spear points made of high-quality raw material from disparate sources, atlatls or "spear throwers," bifaces, and scrapers.

Paleo-Indian sites are rare, in general, and none have been recorded in the decision area, although isolated finds have been identified (BLM 2008). But there is evidence of megafauna in the region, including mammoths; however, there are no data that support exploitation of this resource by Paleo-Indians in GSENM. Instead, surface finds of fluted projectile points are the only indications of Paleo-Indian occupations or activities that have been documented (BLM 2008). These projectile points can be diagnostic or presumed to be representative of association with cultural complexes in the Paleo-Indian Period, based on their shape and manufacture; however, the occurrence of these points does not necessarily provide conclusive evidence of Paleo-Indian activities at the location of the discovery. Later groups, such as those from the Archaic Period, are known to have curated and reused artifacts from other areas and temporal associations. Prehistoric trade is also documented and may obscure the geographic and archaeological record (McFadden 2012).

Archaic Period (5500 BC - AD 200)

During the Archaic period (5000 BC to AD 200), there was a continuation of mobile hunting and gathering, but a shift toward a more generalized subsistence base than in the preceding Paleo-Indian Period. This broadening of diet breadth was likely necessitated by the decline in the abundance of large-bodied game. Archaic groups generally exploited a wider range of environmental settings, but within more geographically restricted areas. Archaeological evidence indicates that mobility was seasonal and tied to the density and distribution of key plant resources across the landscape.

The expansion of diet breadth, which included a greater reliance on plant foods and small game, is reflected in Archaic technology. This is exemplified by grinding slabs, milling stones, various forms of basketry, roasting pits, storage features, various notched and shouldered dart points, and items associated with small-game procurement, such as snares and nets. Although settlement patterns are diverse in the Southwest, Archaic sites are generally small and seasonal. They include both base camps and limited activity or logistical sites, commonly characterized by hearths, roasting features (evidenced by fire-cracked rock), ground-stone tools, and sometimes pit structures.

The Archaic Period encompasses a long span of time from approximately 5500 BC to AD 200 that is characterized by an emphasis on a hunter-gatherer subsistence lifeway. It is seen as an adaptation to a wider use of plants and other animals after the extinction of the Late Pleistocene megafauna and the evolution of environments that are closer to modern conditions. During this period, the climate in the Southwest continued to fluctuate, but ultimately it trended toward a drier pattern, with monsoons and concurrent changes to local and regional ecology. Archaeological evidence from throughout the region indicates that hunter-gatherers increasingly relied on locally available resources and a diverse range of fauna and flora (Cordell 1997, pp. 101-102).

The material culture of the Archaic provides evidence for this shift in resource exploitation. These adaptations, in contrast with the Paleo-Indian Period, include the following:

- Greatly altered and diverse projectile point styles
- Relatively numerous items associated with plant food procurement and processing, such as grinding slabs, milling stones, various forms of basketry, roasting pits, and storage features

The contrast between Paleo-Indian and Archaic technology undoubtedly results from a variety of factors, including varied subsistence orientations, different activities associated with sites in more diverse locations, and differential artifact and site preservation (Fairley 1989a, p. 89).

Diagnostic tools and projectile points, along with obsidian hydration and radiocarbon dating, provide the most conclusive identification and temporal placement of any prehistoric archaeological site, including those from the Archaic. Site depositional characteristics, their location on landforms, habitations, such as pit structures, and sandal and basketry construction also assist in identifying Archaic sites.

Researchers commonly divide the Archaic Period on the Colorado Plateau into the Early, Middle, and Late Phases. Within these phases there are many perspectives among researchers regarding point typologies, specifically whether technologies found in the archaeological record represent different cultural traditions or different patterns of group mobility (Cordell 1997; BLM 2008).

Archaic sites are well represented in the region that encompasses the planning area; however, diagnostic projectile points from the early and middle intervals are relatively scarce on GSENM (BLM 2008). Early Archaic sites (approximately 5500 to 3500 BC) have mostly been classified as short-term campsites. Broken Arrow Cave, an Early Archaic site, was excavated in an alcove near modern day Wahweap Bay of Lake Powell, outside of GSENM. Artifacts found at the Broken Arrow Cave include portions of sandals, yucca cordage, and plant processing tools (Spangler 2001, pp. 413-414).

Middle Archaic Period sites, dating from 3500 to 1500 BC are relatively scarce in the planning area; however, radiocarbon dates from sites on the Kaibab Plateau and in Glen Canyon indicate a Middle Archaic presence. These sites appear to represent small seasonal hunting or plant processing camps (Spangler 2001, pp. 416-417).

Late Archaic sites dating from 1500 BC to AD 200 are more abundant when compared with the earlier periods, suggesting an increase in population from the Middle Archaic. Late Archaic point types, such as Gypsum points, are relatively common in the planning area, indicating that a broad diversity of microenvironments were in use by that time. In fact, a buried Late Archaic residential site has been identified in an alluviated canyon bottom in the Grand Staircase physiographic province (McFadden 2012). Rock art diagnostic of at least the Late Archaic, includes Barrier Canyon and Glen Canyon Linear styles (BLM 2008)

Early Agricultural (1500 BC - AD 700)

The Early Agricultural Period spans the end of the Late Archaic (1500 BC to AD 700) into the Basketmaker II Period (500 to 700 AD). It represents a transition from a completely hunter-gatherer lifeway to adopting self-sustaining agriculture. Basketmaker II sites, on occasion,

contain the earliest forms of pottery in the Southwest, which, among other things, allowed for storage and greater processing of maize and other early cultivated plants. However, common ceramics were not widely adopted until the Basketmaker III period.

Over the past several decades, archaeologists have presented three models for the origins of agriculture in the northern Southwest. The first model for the origins of Colorado Plateau agriculture suggests in situ Archaic populations integrated maize technology through a steady process of diffusion.[27] The transition to agriculture was the result of Archaic populations obtaining agricultural knowledge and adopting farming. Under the diffusion scenario, the transfer of technology to hunter-gatherer groups may occur through the exchange of marriage partners or through fluid band membership (Terlep 2012).

The second model for the development of maize agriculture proposes that groups from the southern Basin and Range, possibly the San Pedro Cochise, migrated north and dispersed across the Colorado Plateau. Similarities between San Pedro Cochise and Basketmaker II pit structures and material culture supports the migration model. In addition, supporters of the migration model suggest that the Colorado Plateau was only sparsely populated during the Late Archaic and Terminal Archaic Periods. According to this model, the process of agricultural diffusion, therefore, would not have been feasible, given the low populations on the Colorado Plateau (Terlep 2012).

A third model involving both in-migration and diffusion may also be possible, with maize technology diffusing to Archaic populations from a migration of San Pedro Cochise culture bearers. Under this model, based on linguistic and mitochondrial DNA evidence, there was a migration from the Great Basin east and south at approximately 7000 BC. Migrants began to occupy northern Arizona, while others continued south into northern and central Mexico. This model argues that with the advent of maize farming in central Mexico, around 4000 BC, the group-to-group diffusion of agricultural technology into the American Southwest occurred rapidly through a similar language family (Terlep 2012).

Empirical data suggest the Basketmakers employed a semi-sedentary subsistence strategy, relying on a mix of maize and foraging. Basketmaker habitations had open air and sheltered subterranean storage cists[28] and pit houses. Basketmaker sites are difficult to discern from earlier Archaic sites, because the botanical evidence from this period rarely survives in open sites. Sheltered sites, such as alcoves, have a better chance of preserving perishable materials, such as pollen and organic artifacts.

Evidence from the Arizona Strip demonstrates that, before they shifted to upland dry areas, Basketmaker populations incorporated floodwater and sub-irrigation techniques for cultivation in the alluvial flats, near the Vermilion Cliff drainages. Terlep (2012) provides a detailed synthesis of archaeological scholarship that indicates Basketmaker II populations began to incorporate dry farming strategies before the advent of pottery.

[27] The dissemination of one people's culture to another.

[28] A belowground earthen or stone-lined pit used the keep perishable and nonperishable resources. Cists may also be used as coffins or burial chambers.

Early Agricultural Period sites provide significant evidence for many hypotheses surrounding this period; specifically, they show that by the end of Basketmaker II, local populations were full-time farmers. They had all of the advantages permanent shelter, stable food source, increasingly complex social life and many of the disadvantages of this more sedentary and agricultural lifestyle poor dental health and common presence of certain deficiency diseases.

Formative Period (100 BC - AD 1250)

Under McFadden's (2016) chronology for the area, the Formative Period (100 BC to AD1250) overlaps the end of the Basketmaker II period. The Formative Period is characterized by the practice of agriculture, the construction of substantial dwellings, the development of long-term storage facilities, and eventually, the wide-scale production of pottery. It is a stage during which mobile hunters and gathers became more sedentary and presumably, more socially complex. Two separate, archaeologically defined, Ancestral Puebloan cultures are recognized in the planning area: the Anasazi and the Fremont (McFadden 2016). These cultures have much in common with one another; however, they are separable, based on their material culture, the geographies they occupied, and their distinctive adaptations to the unique environments found throughout the planning area (Geib 1996).

The Fremont occupied much of northern Utah. In the study area their material culture extended south to the Pink Cliffs of the Grand Staircase, on to portions of Kaiparowits Plateau and into the Escalante drainage basin. Based largely on their use of the Emery Gray ceramic type, they have been assumed to be an extension of the San Rafael (a variant of the Fremont). The long sequence of dates in the planning area strongly suggests that Fremont occupation in the Escalante drainage represents a long-lived local adaptation that began in the Archaic Period and continued as an identifiable entity until contact with the Anasazi during Pueblo II times.

The Virgin Anasazi occupied the Grand Staircase physiographic section of GSENM and portions of Glen Canyon (Geib 1996). Their communities are well documented in a wide range of environments in the St George Basin, southeastern Nevada, and the Arizona Strip (McFadden 2016).

The two groups shared several important traits, including architecture, agriculture, and ceramics. There were also marked differences in their adaptations that clearly distinguish the two cultures. The Virgin Anasazi were agriculturalists that practiced residential mobility. Full-time farmers, they apparently moved farmsteads frequently in response to changing conditions, possibly including resource availability, condition of arable lands, insect infestations, and short- and long-term climatic fluctuations. Virgin Anasazi architecture shows farmsteads and structures that were repeatedly occupied, abandoned, reoccupied, and modified (BLM 2008).

It has been proposed that the Fremont, by contrast, practiced seasonal mobility, moving into the watered valley bottoms in the summer to farm, and then returning to the uplands in the winter to take advantage of such resources as big game and firewood. On-site storage for excess food supplies is a hallmark of Anasazi sites. Fremont residential sites lack on-site storage, but isolated granaries are common in remote canyon locations. Both the Fremont and Anasazi cultures had disappeared from the area by the mid-AD 1200s (BLM 2008).

There is indication in the Fiftymile Mountain area of the Kaiparowits Plateau and in other areas of northeastern Arizona of possibly a third agricultural group, the Kayenta Anasazi. The differences between the sites on Fiftymile Mountain, the Virgin Anasazi sites to the west, and the previous Fremont sites are significant enough that some consider these as evidence of a distinct cultural group. McFadden (2016) suggests an influx of Kayenta traits, possibly representing a migration of Kayenta culture bearers, into the Virgin Anasazi area in the early 1100s, and that within a few decades these Kayenta traits (and potentially individuals) had been absorbed into the Virgin cultural traditions.

Post-Formative Period (AD 1250 - 1500)

The Post-Formative or Late Prehistoric/Protohistoric Period refers to the time after the exodus of the Ancestral Puebloans. Based on the existing archaeological record, the agricultural system on lands in the planning area seem to have ended sometime during the mid- to late AD 1200s. This is roughly concurrent with a period of change throughout the Southwest that has been attributed to prolonged drought, high population levels, an extreme local climate downturn or changes in adaptive behavior. Possibly as early as the AD 1300s, but certainly by AD 1500, there is evidence for a general abandonment of agriculture, decreased population, and return to hunting and gathering lifeways (McFadden 2016).

Numic speakers expanding into the region constitutes an additional hypothesis for the Ancestral Puebloan depopulation of the Arizona Strip. Whether aggression from new groups in the region factors into this Ancestral Puebloan depopulation remains unknown. Nevertheless, the Southern Numic speakers remained in the region throughout this period. Southern Paiute bands were the probable descendants of Numic speakers and Ancestral Paiutes in or near the study area.

The prehistoric Southern Paiute had a mobile hunter-gatherer lifestyle that followed the seasonal rounds of plants, animals, water, and material availability. Family groups would aggregate into larger bands, in response to late summer pinyon nut harvests, communal rabbit drives, and big game hunts. Then they would split again into smaller extended family units and disperse in the winter to their base camps. Surplus foods were cached and recovered as necessary later. Horticulture was very limited. Gardens might be planted in the spring{ XE "Spring" } and left untended until harvest time or were tended by older persons while the balance of the band was hunting and foraging (BLM 2008).

Architecture was limited to brush shelters, lightly constructed in the summer and heavier and more durable in the winter. Basketry was highly developed, and although some ceramic vessels were constructed, their use remained secondary. Heavy items such as metates (grinding stones) might be cached at various locations. Distinctive projectile points, ceramics, and basketry are good indicators of Southern Paiute archaeological sites in the study area.

Basketry constituted the most developed technological product of the Southern Paiute, although brownware ceramics were also crafted. The construction of Numic basketry consists of a mixed twined and coiled technique (Fairley 1989:150-151). Southern Numic hunting tools include desert side-notched projectile points, reused Puebloan points, and possibly fire-hardened wooden points (Fairley 1989:151).

Seasonal camps of the Southern Paiute consist of conical brush structures, rockshelters, and possibly the remains of Ancestral Puebloan structures. Few early Numic structures are currently identified in the Arizona Strip (Fairley 1989a, pp. 151-152).

Recent studies have shown that most of the obsidian on GSENM came in two waves, one in the Archaic and the second during the Late Prehistoric. The Archaic materials represent a much broader ancestral native tradition and cannot be attributed to any one group; the Late Prehistoric materials are likely attributed to the Paiute or ancestral Paiute (BLM 2008).

Historic Period (AD 1500 - Present)

Euro-American presence in the region did not occur until the Dominguez-Escalante exploration expedition in 1776 that sought to find an efficient route from what is now Santa Fe, New Mexico, to Monterey, California. While the Dominguez-Escalante expedition failed to find a new route, the party did become the first Europeans to transverse portions of the Arizona Strip.

During the trip back to Santa Fe, the Dominguez-Escalante expedition passed through the Hurricane Cliffs, modern day Fredonia, Kanab Creek, the Vermilion Cliffs, and the Paria River. Except for brief visits, this region of the Spanish empire was largely untouched by Euro-Americans; however, diseases transmitted by Europeans probably impacted the Southern Paiutes still living in the region well in advance of direct contact with Euro-Americans.

With Mexican independence from Spain in 1821, the social order of the former empire changed drastically. New routes of trade and communication opened up as economic restrictions slackened. By the mid-1830s, Mexican traders were traveling regularly between Santa Fe and Monterey. From this time until the Mexican War (1846-1848), the Old Spanish Trail (as it would later be called) was the most heavily traveled route between New Mexico and California. Despite being a rigorous journey, this route had two distinct advantages: The country it passed through was relatively well known and it bypassed hostile Indians (Fairley 1989b). An early route of the Old Spanish Trail passed along the southern edge of what is now GSENM (Warren 2004).

The United States took title to the western lands acquired from Mexico through the Treaty of Guadalupe Hidalgo in 1848. Under the leadership of Brigham Young, converts to the Church of Jesus Christ of Latter-Day Saints (LDS) began arriving in Utah and establishing communities. Between 1852 and 1864, they initiated a series of reconnaissance expeditions to scout out the territory lying south and east of their missions in southern Utah. Initial settlement regionally represented a direct extension of earlier Mormon settlement in southwestern Utah (Fairley 1989b).

During the early 1860s, the Mormon settlements in southern Utah were increasingly plagued by raids from Utes, Navajos, and local Paiutes. In 1865, a growing unrest among the Ute bands in Sevier Valley of central Utah erupted into violent confrontation. The Black Hawk War, as it came to be known, was ignited by a series of coordinated attacks on Mormon livestock (Fairley 1989b). This conflict lasted until 1872, when federal troops intervened. In total, thousands of heads of cattle were lost during the seven-year conflict, and many communities were deeply impacted or abandoned.

Pioneers established ranching outposts, and later, lumber mills, to serve the growing settlements in southern Utah after conflicts with tribes declined. The LDS purchased Pipe Springs{ XE "Spring" } from the Southern Paiute in 1870, solidifying an enduring presence in the region. Many of the original ranching operations were communally organized under the LDS, but in time some became private enterprises due to the scarcity of water and the ability to secure water rights.

Access to national markets was through Lees Ferry, over the Colorado River to the Atlantic and Pacific Railroad at Flagstaff (Fairley 1989b). The railroad came to Flagstaff and northern Arizona in 1882 and opened up the region to eastern and western markets for local ranchers, merchants, and mine operators. With this, many sheep and cattle operations shifted from subsistence and low-level production to large-scale ranching activities in the planning area. The railroad also allowed common building materials and other goods to be shipped to settlers and others in the broader area, as reflected in many historic buildings, structures, and ranching features of this era. Some examples are standardized windows, corrugated-metal roofing, bricks, steel, and barbed wire.

The growth in ranching also encouraged broader settlement in the area and shaped many of the local communities and the development of travel corridors such as the Burr Trail. As with other areas in the desert Southwest, these local communities and isolated ranches were most often collocated with perennial{ XE "Perennial" } springs{ XE "Spring" }, creeks, and rivers. Likewise, most ranching was concentrated in these areas and to grasslands and other foraging areas in pastures next to water. This combination remains critical to cattle operations today and defines much of the ranching activities in GSENM.

Copper mining and agriculture also took place in the region, although agriculture has never been central to the regional economy, largely due to the desert landscape. Most farming was conducted to meet individual family subsistence needs; organized farming was largely restricted by the availability of water and irrigation. The Mormons established many of these early family farmsteads at scattered locations, wherever springs{ XE "Spring" } issued forth with sufficient water to irrigate several acres (Fairley 1989b).

Ranching, small-scale farming, and mining remain key elements of the modern cultural landscape of the planning area, although other activities, such as energy production and distribution and public land management, are now also important elements of the modern economy. Despite this, many of the descendants of the original settlers, cowboys, miners, and ranchers still live in the area and maintain a close connection to their past, to grazing, and to the land. In addition, modern Native Americans continue to use the planning area for their cultural connections and for ceremonies and other traditional practices, such as wild medicinal plant gathering.

3.9.2 Current Conditions

As the focus of this MMP{ XE "Monument Management Plan, Grand Staircase-Escalante National Monument (MMP 2000)" }-A/EIS is on grazing administration decisions, the following description of current conditions pertains to the effects of grazing on historic properties. As of 2016, approximately seven percent of the land in GSENM and Glen Canyon has been subject to intensive cultural resource investigations (Class III), resulting in the identification of more than 5,000 archaeological sites. However, the number of TCPs{ XE "Traditional Cultural Property

(TCP)" } in the decision area is largely unknown, although the Navajo and Kaibab Paiute have informally named two potential TCPs. Additional tribal consultation may identify more information on TCPs or other tribal resources.

From 2011 to 2015, archaeologists from the BLM and Colorado Plateau Archaeological Alliance conducted a monitoring and cultural resources inventory program at 37 grazing allotments, although only 23 had enough information for detailed analysis by the team. The monitoring and inventory were specifically designed to support and provide key data for the GSENM Livestock Grazing Plan Amendment EIS (Zweifel 2016).

The archaeologists monitored previously documented sites where grazing impacts had been recently noted. The archaeologists focused their monitoring on ascertaining if these sites are presently being impacted. A key finding was that some previously recorded grazing impacts at these sites may have in fact indicated only the presence of livestock, rather than any impacts on the site's integrity. In allotments where cultural resource inventories were inadequate or incomplete, or in similar areas within large allotments, archaeologists inventoried cultural resources to obtain the needed information. Generally, GSENM range staff chose these inventory locations as areas where cattle would tend to congregate, such as near water and feed, or for other variables.

Determining the severity of impacts at the historic properties considered in this project was based on how these historic properties were eligible for the NRHP{ XE "National Register of Historic Places (NRHP)" } (most commonly under Criterion D). In general, impacts that led to a loss of integrity and information potential were considered adverse effects under the NHPA{ XE "National Historic Preservation Act (NHPA)" }. These effects often came from certain types of grazing activity, including heavily rutted trails and livestock congregation, leading to erosion. Other adverse effects were from livestock rubbing on rock art, breaking or displacing artifacts, and damaging site features. Indications of livestock use, such as hoof prints, dung accumulation, and lightly rutted trails, would not be considered adverse if they did not diminish a historic property's integrity or scientific value. However, such indicators could inform the potential for future adverse effects.

The 37 allotments included in this study constitute only a fraction of the allotments across the decision area; however, they are distributed across GSENM and portions of Glen Canyon and represent all three major physiographic provinces: the Grand Staircase, the Kaiparowits Plateau, and the Escalante Canyons/Benches.

Data on the current condition of cultural resources in Glen Canyon derive from the values and purposes determination (NPS 2009) submitted to GSENM as part of the ongoing preparation for the livestock grazing EIS. This Determination summarizes cultural resources information on all Glen Canyon/GSENM shared allotments. It assesses the potential impacts of the proposal in accordance with applicable laws and policies concerning resource management and protection.

Glen Canyon has specific expectations for the condition of cultural resources throughout the planning area, measured as the integrity of cultural sites across livestock-areas being equal to those areas remaining ungrazed. Glen Canyon chooses this standard because livestock degradation, if present, would affect the ability of cultural sites to provide scientific, cultural,

educational, and interpretive value, as required by laws and regulations. To determine if livestock practices were in fact affecting cultural resources, archaeologists documented this type of information directly on the site form during the initial survey and ongoing condition assessment monitoring. If direct or indirect impacts were found at the site, the archaeologists noted in on the site form.

For this determination, site forms and monitoring forms were examined individually, and information pertaining to the nature of features, artifacts, condition, and their cultural affiliation was manually tallied and then summarized, using simple percentage calculations. No attempt was made to rerecord sites in the field or to reanalyze collected materials.

The results of the 2009 NPS assessment identified more than 500 documented archaeological sites in the active allotments in Glen Canyon. Of those that are considered eligible for listing on the NRHP{ XE "National Register of Historic Places (NRHP)" }, 145 (around 27 percent) are identified as having been impacted to varying degrees by livestock and grazing-related activities.

A Programmatic Agreement, currently under development between the GSENM and Glen Canyon, would allow the agencies to share a breadth of data, including locational information related to cultural resources and to areas known to have concentrations of livestock. Using these data, especially in conjunction with permittee input, should provide a tool that could help pre-plan the location of range improvements to avoid or minimize potential adverse effects to historic properties. This approach should also help direct future monitoring and survey activities and broader collaboration between the GSENM and Glen Canyon.

3.9.3 Trends

Trends measure the change of cultural resources over time and track impacts that may be altering, beneficially or adversely, the integrity of historic properties.

The GSENM cultural resource monitoring and inventory study revealed that grazing-related impacts, and the potential for those impacts, vary greatly from allotment to allotment. Perhaps most striking is the apparently significant reduction in grazing impacts from previous recordings, as opposed to grazing-related adverse effects noted in recent monitoring. This may result from a combination of factors, such as the grazing impacts recording issue described above and the possible lessening of actual grazing pressures, differential land use by cattle year-to-year, vegetation changes, or simple weather- or seasonal-related minimization of evidence of cattle use. These differences may also relate to sediment types, such as those in the Last Chance and Headwaters allotments that may be more stable and less prone to erosion and livestock disturbance.

Both allotments share similar sediment and vegetation and little to no grazing-related impacts; however, the Headwaters allotment has a significantly higher stocking rate{ XE "Stocking Rate" } than the adjacent Last Chance allotment. In contrast, the Lower Cattle allotment has roughly 41 percent of its sites showing adverse grazing impacts, with twice the number of livestock as Headwaters.

About 10.7 percent of the monitored sites in GSENM study area showed grazing-related adverse impacts as presented below in **Table 3-25**, Summary of Monitoring and Inventory

Results 2011-2016. Continued monitoring would allow GSENM to track changes at sites, to identify potential impacts that may lead to adverse effects, and to respond effectively in order to protect NRHP{ XE "National Register of Historic Places (NRHP)" }-eligible resources. For sites where significant impacts have already occurred, mitigation techniques would be required to resolve the adverse effects.

The percentage of historic properties impacted by grazing varied across allotments, from 9 to 64 percent. While this assessment characterizes the current condition of cultural resources, it also allows the NPS to systematically determine whether resource conditions are trending toward or away from meeting Glen Canyon resource objectives.

According to the assessment, the fragile and nonrenewable cultural resources of Glen Canyon have been and are being impacted by livestock; the resource conditions at 11 allotments are considered to be moving away from meeting resource objectives.

Also of note are the stocking rates{ XE "Stocking Rate" } over the past 18 years (the period for which records are available). In almost all the allotments considered in the GSENM study, actual use is less than, sometimes far less than, the permitted stocking rates. If actual stocking rates were increased, there could be a rise in impacts on historic properties. Fewer livestock on any given piece of land may likely result in fewer grazing-related impacts. But because allotments and the density and distribution of historic properties vary, along with types of range improvements{ XE "Range Improvement" }, the nature of specific impacts would have to be considered at the permit renewal level.

Further, improved rangeland management and holistic grazing measures could reduce impacts or adverse effects as a result of grazing or increases in stocking rates{ XE "Stocking Rate" }. Other factors that could reduce impacts are piping water away from historic properties, blocking livestock access with natural materials, and fencing sensitive resources. Implementing these rangeland techniques could significantly benefit the preservation of historic properties and reduce adverse effects.

Table 3-25
Summary of Monitoring and Inventory Results 2011-2016

Allotment	Total Number of Sites	Monitored Sites	New Sites Documented	Acres of New Inventory	New Sites with Grazing Effects	Grazing Effects Noted Previously	Previous Grazing Effects Not Visible	Livestock Presence (No Adverse Effects)	Adverse Grazing Effects Present	% of Sites Adversely Effected
Calf Pasture	16	0	16	320	0	N/A	N/A	2	0	0%
Circle Cliffs	15	15	N/A	0	N/A	15	8	7	1	7%
Cottonwood	58	40	18	840	2	30	4	24	12	21%
Coyote	13	13	N/A	0	N/A	4	0	5	5	38%
Dry Valley	5	0	5	555	0	N/A	N/A	0	0	0%
First Point	5	0	5	285	0	N/A	N/A	0	0	0%
Granary Ranch	7	1	6	80	0	N/A	N/A	0	0	0%
Headwaters	58	55	3	331	0	47	21	29	0	0%
Lake	99	29	70	640	27	0	N/A	27	4	4%
Last Chance	82	77	5	406	0	63	38	28	4	5%
Lower Cattle	39	6	33	560	12	0	0	14	16	41%
Meadow Canyon	60	5	55	686	0	1	0	5	0	0%
Mollies Nipple	53	38	15	404	1	22	14	18	8	15%
Nipple Bench	13	11	2	265	0	7	1	4	2	15%
Pine Point	23	0	23	536	0	N/A	N/A	0	0	0%
Round Valley	15	8	7	167	0	0	N/A	7	1	7%
Rock Creek Mudholes	24	15	9	N/A	4	N/A*	N/A	8	15	61%
School Section	7	N/A	7	452	0	N/A	N/A	0	0	0%
Swallow Park	7	7	N/A	0	N/A	7	4	3	0	0%
Upper Hackberry	21	1	20	558	0	0	N/A	0	1	5%
Upper Paria	18	3	15	1148	7	0	N/A	6	1	6%
Vermilion	53	45	8	152	0	30	15	16	4	8%
White Sage	6	6	N/A	0	N/A	5	0	6	0	0%
Other Allotments	22	19	3	0	0	4	4	0	3	14%
Totals:	**719**			**8385**				**209**	**77**	**10.7%**

Source Zweifel 2016

Note Summary of GSENM monitoring and inventory results, 2011 2016

*Data for this allotment is based on the Grand Bench pasture; no NPS information was available for previous site conditions

3.9.4 References

Bamforth, D. 1986. "Technological efficiency and tool curation." *American Antiquity* 51:38-50.

Binford, Lewis R. 1979. "Organization and formation processes: looking at curated technologies." *Journal of Anthropological Research* 35:255-273.

Birnbaum, Charles. 1994. Protecting Cultural Landscapes: Planning, Treatment and Management of Historic Landscapes. National Park Service Preservation Brief 36. Internet website: https://www.nps.gov/tps/how-to-preserve/preservedocs/preservation-briefs/36Preserve-Brief-Landscapes.pdf.

BLM (United States Department of the Interior, Bureu of Land Management). 2008. Grand Staircase-Escalante National Monument Draft Monument Management Plan Amendment and Draft Rangeland Health Environmental Impact Statement. BLM, Grand Staircase-Escalante National Monument, Kanab, Utah. October 2008.

Cordell, Linda. 1997. *Archaeology of the Southwest, Second Edition.* Academic Press, San Diego California.

Fairley, Helen. C. 1989a. "Prehistory." In *Man, Models, and Management: An Overview of the Arizona Strip and the Management of its Cultural Resources* (Jeffery H. Altschul and Helen C. Fairley, editors). Pp. 85-152. UDSA Forest Service/USDI Bureau of Land Management, US Government Printing Office, Washington DC.

______. 1989b "History." In *Man, Models, and Management: An Overview of the Arizona Strip and the Management of its Cultural Resources* (Jeffery H. Altschul and Helen C. Fairley, editors). Pp. 153-218, UDSA Forest Service/USDI Bureau of Land Management, US Government Printing Office, Washington DC.

Geib, P. R. 1996. "Formative Cultures and Boundaries: Reconsideration of the Fremont and Anasazi." In *Glen Canyon Revisited,* authored by P. R. Geib, pp. 98 114. University of Utah Anthropological Papers, no. 119. University of Utah Press, Salt Lake City.

Horvat, Mary, and Robert Melnick. 1988. Dorris Ranch National Register Nomination. Internet website: http://focus.nps.gov/nrhp/GetAsset?assetID=c3cdf149-0312-4499-926e-45d8dafc357a.

Irwin-Williams, Cynthia, and C. Vance Haynes, Jr. 1970. "Climatic change and early population dynamics in the southwestern United States." *Quaternary Research* 1:59-71.

McFadden, Douglas A. 2012. Excavations at the Arroyo Site, 42KA3976: A Pueblo II II/III Virgin Anasazi Farmstead. Utah Cultural Resource Series No. 28, Grand Staircase-Escalate National Monument Special Publication No. 4. United States Department of the Interior, Bureau of Land Management, Salt Lake City, Utah.

______. 2016. Formative Chronology and Site Distribution on the Grand Staircase-Escalate National Monument: A Research Reference. Utah Cultural Resource Series No. 28, Grand Staircase-Escalate National Monument Special Publication No. 4. United States Department of the Interior, Bureau of Land Management, Salt Lake City, Utah. May 2016.

Nelson, Margaret. 1991. "The Study of Technological Organization." In *Archaeological Method and Theory,* Vol. 3(Michael Schiffer, editor). Pp. 57-100. University of Arizona Press, Tucson.

NPS (United States Department of the Interior, National Park Service). 1998. National Park Service NPS-28 Cultural Resource Management Guideline. June 1998. Internet website: https://www.nps.gov/parkhistory/online_books/nps28/28contents.htm.

______. 1999. Glen Canyon National Recreation Area Grazing Management Plan{ XE "Grazing Management Plan, Glen Canyon (GzMP 1999)" } and Finding of No Significant Impact. NPS, Glen Canyon National Recreation Area, Page, Arizona. August 1999.

______. 2002. How to Apply the National Register Criteria for Evaluation. National Register Bulletin 15. Internet website: ttps://www.nps.gov/nr/publications/bulletins/pdfs/nrb15.pdf.

______. 2006. NPS Management Policies. Internet website: https://www.nps.gov/policy/MP2006.pdf.

______. 2009. Glen Canyon Values and Purposes{ XE "Values and Purposes (Glen Canyon)" } Determination. Page, Arizona.

______. 2014. Foundation Document: Glen Canyon National Recreation Area and Rainbow Bridge National Monument. Page, Arizona. September 2014.

Parker, Patricia L., and Thomas F. King. 1998. Guidelines for Evaluating and Documenting Traditional Cultural Properties. National Register Bulletin No. 38. Internet website: https://www.nps.gov/nr/publications/bulletins/pdfs/nrb38.pdf.

Spangler, Jerry D. 2001. Human Landscapes and Prehistoric Paradigms: A Class I Overview of Cultural Resources in the Grand Staircase-Escalate National Monument. Manuscript on file at the Grand Staircase-Escalante National Monument Field Office, Kanab, Utah.

Terlip, Michael L. 2012. "A spatial and stylistic analysis of cup and channel petroglyphs from the Arizona Strip." Master's thesis on file at the Grand Staircase-Escalante National Monument Field Office, Kanab, Utah.

Warren, Elizabeth von Till. 2004. The Old Spanish National Historic Trail. Pathways Across America (Summer 2004). The Partnership for the National Trail System. Internet website: http://www.oldspanishtrail.org/learn/trail_history.php.

Zweifel, M. 2016. Cultural Resource Site Condition and Trend Analysis: Results of 2011-2016 Grazing Allotment Inventory and Monitoring, Grand Staircase-Escalante National Monument; With Additional Information from Glen Canyon National Recreation Area. Draft document: Not for Public Release.

3.10 Paleontological Resources

Paleontology is the study of prehistoric life, its evolution, and its interaction with the environment (paleo-ecology). Paleontological resources{ XE "Paleontological Resource" } include any fossilized remains or traces of organisms that are preserved in or on the Earth's crust, that are of scientific interest, and that provide information about the history of life. Paleontological resources, whether invertebrate, plant, trace, or vertebrate fossils, constitute a fragile and nonrenewable record of the history of life.

The BLM's policy is to manage paleontological resources{ XE "Paleontological Resource" } for scientific, educational, and recreational values (e.g., hobby collecting of invertebrate fossils and petrified wood) and to protect these resources from adverse impacts. To accomplish this goal, paleontological resources must be professionally identified and evaluated, and paleontological data should be considered as early as possible in any decision-making process.

Paleontological resources{ XE "Paleontological Resource" } are managed ~~according to~~per the BLM Manual Section 8270, Paleontological Resource Management, BLM Handbook H-8270-1, General Procedural Guidance for Paleontological Resource Management, and applicable BLM instructional memoranda and bulletins.

Note that additional protection measures have now been enacted under the Omnibus Public Lands Act of 2009 (123 Stat. 1174 Public Law 111-11, Subtitle D), giving paleontological resources{ XE "Paleontological Resource" } protection under law. The BLM is developing regulations to implement the requirements of this law. BLM guidance (IM 2008-009, Potential Fossil Yield Classification System for Paleontological Resources on Public Lands) defines a new system for classifying paleontological resources, the potential fossil yield classification (PFYC) system. It provides a uniform tool to assess potential occurrences of paleontological resources and to allow evaluation of potential impacts on these resources. It is applied in a broad approach for planning and as an intermediate step in evaluating specific projects. Each class is defined briefly below:

Class 1, Very Low Potential—Geological units not likely to contain recognizable fossil remains, such as igneous, metamorphic, and Precambrian rocks

Class 2, Low Potential—Sedimentary geological units not likely to contain vertebrate fossils or scientifically significant invertebrate fossils, such as altered formations or Holocene sediments

Class 3, Moderate or Undetermined Potential—Fossiliferous sedimentary geological units where fossil content varies in significance, abundance, and predictable occurrence; or sedimentary units of unknown fossil potential

Class 3 is divided into two parts:

Class 3a, Moderate Potential—Units are known to contain vertebrate fossils or scientifically significant invertebrate fossils, but these occurrences are widely scattered; common invertebrate or plant fossils may be found in the area.

Class 3b, Undetermined Potential—Units exhibit geological features that suggest significant fossils could be present, but little information about the paleontological resources of the unit or area is known. This may indicate the unit or area is poorly studied and field surveys may uncover significant fossils.

Class 4, High Potential—Geological units that contain a high occurrence of significant fossils; vertebrate fossils or scientifically significant invertebrate or plant fossils are known to occur and have been documented but may vary in occurrence and predictability

Class 5, Very High Potential—Highly fossiliferous geological units that consistently and predictably produce vertebrate fossils or scientifically significant invertebrate or plant fossils.

The NPS has similar guidance; the broad policy direction for paleontological resources{ XE "Paleontological Resource" } is included in Chapter 4, Section 4.8, of NPS Management Policies (2006). The NPS is charged with studying and managing paleontological resources in their paleo-ecological context[29] and to have programs to inventory and monitor fossils, especially in areas prone to rapid erosion. Resources are protected and stabilized, and field research is encouraged by qualified academic institutions. Paleontological resource locations are confidential and their sale or casual collection is prohibited.

Glen Canyon's values and purposes related to paleontological resources{ XE "Paleontological Resource" } notes, "Dinosaur trackways found in the Morrison formation, shark teeth in the Mancos Shale, and Quaternary Period resources including packrat middens and preserved faunal and floral remains are irreplaceable scientific resources" (NPS 1999, p. 24). Goals for resource management are preserving and protecting the resource in situ or recovering scientific data if resources cannot be safeguarded from impacts.

Paleontological resources{ XE "Paleontological Resource" } are integrally associated with the geologic rock units (formations, members, or beds) or sediments in which they are preserved. The probability for finding paleontological resources can be broadly predicted from the geologic units present at or near the surface. Therefore, geologic mapping paired with the PFYCs can be used for assessing the potential for paleontological resources.

3.10.1 Current Conditions

The fossils found in the rocks and unconsolidated deposits of GSENM are mostly the remains and traces of terrestrial organisms. Most of these fossils date to between 65 million and 250 million years ago. Informally called the Age of Dinosaurs, the Mesozoic Era saw the rise of mammals, modern snakes and lizards, modern amphibians, dinosaurs, turtles, crocodiles, marine reptiles, birds, flowering plants, and many kinds of insects. Rock layers in the region faithfully

[29] That is, in terms of the geologic data associated with a particular fossil that provides information about the ancient environment.

record local life and surface conditions on land for much of this time, giving paleontologists exceptional opportunities to learn more about this crucial time of biological development. Rocks dating to the latter part of the Mesozoic Era, known as the Cretaceous (65 to 144 million years ago) have already proven to contain one of the best terrestrial fossil records for this time in the world. The rock strata in GSENM and Glen Canyon can help paleontologists understand these ancient ecosystems.

Paleontological Resources by Geologic Formation

Paleontological resources{ XE "Paleontological Resource" } are integrally associated with the geologic rock formations or sediments in which they are located. Fossils found in one location may be expected to occur elsewhere in the formation along the same stratigraphic horizon (Gillette and Hayden 1997). The planning area contains approximately 19 formations at the surface, most of which are known to be or are likely to be fossiliferous. A comprehensive paleontological resource inventory of these formations has not been completed, but a review of paleontological research on formations in the planning area has identified the types of fossil resources that could occur. **Table 3-26**, Geologic Formations in GSENM and Glen Canyon, identifies these formations, their predominant depositional environments, the types of fossils present, and the formations' potential to contain paleontological resources.

Table 3-26
Geologic Formations in GSENM and Glen Canyon

Formation Age	Formation Name	Depositional Environment	Fossil Present	~~Potential*~~PFYC
Neogene	Surficial Alluvium and Colluvium	Fluvial and Lacustrine	Vertebrate	Class 3~~Medium~~
	Basalt Flows and Cores	Volcanic	Vertebrate	Class 1~~Low~~
	Surficial Eolian	Eolian	Vertebrate	Class 2~~Low~~
	Surficial Landslide	Gravitational and Mass Flow	Vertebrate	Class 2~~Low~~
	Volcanic Rocks (including basalt, rhyolite, andesite, and tuffaceous rocks)	Volcanic	Vertebrate	Class 1~~Low~~
	Sevier River Formation	Fluvial, Lacustrine	Vertebrate, invertebrate	~~Medium~~Class 3
Paleogene	Brianhead Group	Fluvial, Volcanic, Lacustrine	Invertebrates	~~Medium~~Class 3
	Claron Formation	Lacustrine, Fluvial	Vertebrate, invertebrate, plant, trace plant	Class~~Medium~~
Cretaceous	Kaiparowitz Formation	Fluvial, Lacustrine	Vertebrate, invertebrate, plant, trace vertebrate	Class 4~~High~~
	Wahweap Formation	Fluvial, Lacustrine	Vertebrate, invertebrate, plant, trace vertebrate	Class 4~~High~~

Table 3-26
Geologic Formations in GSENM and Glen Canyon

Formation Age	Formation Name	Depositional Environment	Fossil Present	~~Potential*~~PFYC
	Straight Cliffs Sandstone	Fluvial, Coastal Mires, Beach/Marginal Marine, Marine	Vertebrate, invertebrate, plant, trace vertebrate, trace invertebrates	Class 4~~High~~
	Tropic Shale	Marine	Vertebrate, invertebrate, plant, trace invertebrate	Class 4~~High~~
	Dakota Formation	Fluvial, Lacustrine, Coastal Mires, Beach/Marginal Marine, Marine	Vertebrate, invertebrate, plant, trace plant	Class 4~~High~~
Jurassic	Henrieville Sandstone	Fluvial, Eolian, Beach/Marginal Marine	Plant	Class 2~~Low~~
	Entrada Sandstone	Eolian, Beach/Marginal Marine, Fluvial	Plant, trace vertebrates	Class 3~~Medium~~
	Caramel Formation/Page Sandstone	Marine, Beach/Marginal Marine, Fluvial	Invertebrate, plant, trace invertebrate, trace vertebrate	Class 3~~Medium~~
	Temple Cap Sandstone	Eolian	None identified	Class 3~~Medium~~
	Navajo Sandstone	Eolian, Lacustrine	Vertebrate, invertebrate, plant, trace vertebrate	Class 3~~Medium~~
	Kayenta Formation	Fluvial, Eolian	Vertebrate, invertebrate, plant, trace vertebrate	Class 4~~High~~
Triassic-Jurassic	Moenave Formation	Fluvial, Lacustrine	Vertebrate, plant, invertebrate, trace vertebrate, trace invertebrate	~~High~~Class 4
Triassic	Chinle Formation	Fluvial, Lacustrine	Vertebrate, invertebrate, plant, trace vertebrate, trace invertebrate	~~High~~Class 4
	Moenkopi Formation	Beach/Marginal Marine, Marine	Vertebrate, invertebrate, plant, trace vertebrate	~~Medium~~Class 3
Permian	Kaibab Limestone	Marine	Vertebrate, invertebrate	~~Medium~~Class 3

Table 3-26
Geologic Formations in GSENM and Glen Canyon

Formation Age	Formation Name	Depositional Environment	Fossil Present	~~Potential*~~PFYC

Sources: Stokes 1986; Hintze 1988; Doelling and Davis 1989; Gillette and Hayden 1997; Winkler 1990; Foster et al. 2001; Titus 2005

~~*Potential is defined as follows:~~
~~High – Areas that are known to contain vertebrate fossils or noteworthy occurrences of invertebrate or plant fossils. Consideration of paleontological resources{ XE "Paleontological Resource" } will be necessary if the BLM's review of available information indicates that such fossils are present in the area.~~
~~Medium – Areas with exposures of geological units or settings that have high potential to contain vertebrate fossils or noteworthy occurrences of invertebrate or plant fossils. The presence of geologic units from which such fossils have been recovered elsewhere may require further assessment of these same units where they are exposed in the area of consideration.~~
~~Low – Areas that are very unlikely to produce vertebrate fossils or noteworthy occurrences of invertebrate or plant fossils, based on their surficial geology, igneous or metamorphic rocks, extremely young alluvium, colluvium, or eolian deposits, or the presence of deep soils. However, if possible it should be noted at what depth bedrock may be expected in order to determine if fossiliferous deposits may be uncovered during surface-disturbing activities.~~

Paleontological Localities

Reports of fossils throughout the decision area date to the early twentieth century. Most of these references to fossil resource locations have no site identification, or they provide only vague explanations of fossil locations (Gillette and Hayden 1997). Extensive scientific exploration in the region has increased dramatically in the past 15 to 20 years (Gillette and Hayden 1997), mostly in GSENM. As of 2005, more than 950 paleontological localities were documented there, over 500 of which are found in Garfield County (BLM 2008).

There are also more than 150 localities that have not had their exact locations identified, so the land status has not been determined. The number of localities is not due to the lack of fossils, but due to a lack of research. The wealth of scientific significance of fossils found in and next to GSENM demonstrates the potential for new localities. Surveys on Glen Canyon lands have revealed more than 350 fossil sites, many of which occur in the decision area (Santucci and Kirkland 2010).

3.10.2 Trends

Trends measure the rate of change to paleontological resources{ XE "Paleontological Resource" } over time. Essentially, trends track impacts that are effectively altering the integrity or physical condition of the resources. For paleontological resources, the primary factors affecting their condition are natural erosion and human collection (both legal and illegal). Natural erosion is an ongoing process that both helps paleontologists by exposing fossil resources and hinders them by washing away resources from their scientific context or destroying them through weathering.

Fossils in the region represent a diverse array of plants, invertebrates, and vertebrates. Numerous scientifically significant specimens have been found in GSENM. The demand for paleontological resources{ XE "Paleontological Resource" } for research purposes is expected to continue to be high in the region, with most new localities found in GSENM due to its emphasis on scientific study and investigations. However, research at existing localities is

expected to continue and new localities are expected to be identified. As research increases, the number of localities is expected to increase as well.

Recent surveys and studies in Glen Canyon indicate that many fossil sites are impacted by Lake Powell fluctuations. In addition, a recent preliminary study has provided estimates of erosion rates on the fossiliferous Tropic Shale, indicating extremely high rates and subsequent damage and loss of fossils (Miller 2015).

3.10.3 References

BLM (United States Department of the Interior, Bureau of Land Management). 2008. Kanab Proposed RMP and Final EIS. Pp. 3-72.

Doelling, H. H., and F. D. Davis. 1989. The Geology of Kane County, Utah: Geology, Mineral Resources, Geologic Hazards. Utah Department of Natural Resources, Utah Geological and Mineral Survey, Bulletin 124.

Foster, J. R., A. L. Titus, G. F. Winterfeld, and M. C. Hayden. 2001. Paleontological Survey of the Grand Staircase-Escalante National Monument, Garfield and Kane Counties, Utah. Utah Department of Natural Resources, Utah Geological Survey, Special Study 99.

Gillette, D. D., and M. C. Hayden. 1997. A preliminary investigation of paleontological resources{ XE "Paleontological Resource" } within the Grand Staircase-Escalante National Monument, Utah. Utah Geological Survey Circular 96. Utah Department of Natural Resources. Salt Lake City, Utah.

Hintze, L. F. 1988. Geologic History of Utah. Second edition, Brigham Young University Geological Studies Special Publication 7, Provo, Utah.

Miller, Anne. 2015. Recent Geomorphic Changes in the Tropic Shale and Potential Effects to Paleontology Resources. Unpublished report, Science & Resources Management Division, Glen Canyon National Recreation Area.

NPS (United States Department of the Interior, National Park Service). 1999. Glen Canyon National Recreation Area Grazing Management Plan{ XE "Grazing Management Plan, Glen Canyon (GzMP 1999)" } and Finding of No Significant Impact. NPS, Glen Canyon National Recreation Area, Page, Arizona. August 1999.

______. 2006. NPS Management Policies. Internet website: https://www.nps.gov/policy/MP2006.pdf.

Santucci, V. L., and J. L. Kirkland. 2010. A Survey of Paleontological Resources from the National Parks and Monuments in Utah. Utah Geological Association Publication 28.

Stokes, W. L. 1986. Geology of Utah. Utah Museum of Natural History, University of Utah and Utah Geological and Mineral Survey, Department of Natural Resources, State of Utah. Salt Lake City.

Titus, A. 2005. Draft Classification Map. Unpublished. Grand Staircase-Escalante Files. As cited in BLM 2008.

Winkler, G. R. 1990. Geologic Map of the Cedar City 1° X 2° Quadrangle, Utah. United States Department of the Interior, United States Geological Survey, Internet website: http://geology.utah.gov/maps/geomap/1x2/pdf/ofr90-34.pdf.

3.11 Visual Resources

Visual resources refer to the visible features on a landscape, such as land, water, vegetation, animals, and structures. These features contribute to the scenic or visual quality and appeal of the landscape (BLM 1986).

The NPS refers to visual resources as scenic resources. For purposes of this section, the term visual resources is used unless the text specifically refers to NPS scenic resources.

BLM Visual Resource Management System

The BLM's Visual Resource Management (VRM) system is a way to identify and evaluate visual resources in order to determine appropriate levels of management. The objective of the VRM is to manage public lands to protect the quality of their scenic (visual) values. Visual values are identified through the VRM inventory and are considered with other resource values in the land use planning process. VRM objectives are established in land use plans and provide the standards for planning, designing, and evaluating future management actions and projects.

The objectives for each of the four VRM classes are as follows:

- Class I To preserve the existing character of the landscape. This class provides for natural ecological changes; however, it does not preclude very limited management activity. The level of change to the characteristic landscape should be very low and must not attract attention.
- Class II To retain the existing character of the landscape. The level of change to the characteristic landscape should be low. Any changes must repeat the basic elements of form, line, color, and texture found in the predominant natural features of the characteristic landscape.
- Class III To partially retain the existing character of the landscape. The level of change to the characteristic landscape should be moderate. Management activities may attract attention but should not dominate the view of the casual observer. Changes should repeat the basic elements found in the predominant natural features of the characteristic landscape.
- Class IV To provide for management activities that require major modification of the existing character of the landscape. The level of change to the characteristic landscape can be high. These management activities may dominate the view and be the major focus of viewer attention. However, every attempt should be made to minimize the impact of these activities through careful location, minimal disturbance, and basic element repetition.

VRM Classes were established for GSENM in the MMP{ XE "Monument Management Plan, Grand Staircase-Escalante National Monument (MMP 2000)" } (BLM 2000), for the KFO in the Kanab RMP (BLM 2008a), and for the ASFO in the Arizona Strip RMP (BLM 2008b). Policy clarification for managing all WSAs as VRM Class I was published shortly after the MMP was signed; thus, all WSAs in GSENM are managed as such, although the MMP lists them as VRM Class II areas.

NPS Scenery Management

Glen Canyon was established in 1972 "to provide for public use and enjoyment and to preserve the area's scientific, historic, and scenic features." Scenic resources are subject to the NPS nonimpairment standard described in Section 1.4.4 of the NPS Management Policies (NPS 2006).

In Glen Canyon, there is no specific management for scenic resources; however, Glen Canyon is divided into management zones that have implications for management of scenic resources. Most of the decision area is in the Natural and Recreation and Resource Utilization{ XE "Utilization" } Zones; a small portion is in the Development Zone.

The Natural Zone is managed for its outstanding scenic resources. Its relatively undisturbed areas are isolated and remote from human activities and border on places with established land use practices that complement those of the Natural Zone. Consumption of renewable resources is subject to the protection of the recreational values of the area. Most of the Natural Zone is proposed as wilderness.

The NPS manages the Recreation and Resource Utilization{ XE "Utilization" } Zone to maintain natural processes and to enhance fish and game populations. Consumption of renewable and nonrenewable resources is subject to the protection of park resources and values{ XE "Resources and Values (Glen Canyon)" }, including recreation.

The NPS manages the Development Zone to provide visitor services and maintain facilities. This zone includes the permanent structures and operations necessary to support recreation and allows a wide range of activities.

3.11.1 Current Conditions

The entire planning area is generally an intact landscape. This is due in large part to its isolation and rugged topography and the history of past land uses, including grazing, as well as to the status of most of the area as a national monument or national park system unit. Most of the cultural modifications consist of structural and nonstructural range improvements{ XE "Range Improvement" } (e.g., seedings{ XE "Seeding" }, water developments, fences, and corrals), roads, recreation infrastructure, such as parking areas, kiosks, and trailheads, and utility infrastructure, such as power lines and communication sites.

For BLM-managed lands, the landscape is described in terms of scenic quality, sensitivity, and visual distance zones. Those three components are then combined to produce an overall visual resource inventory (VRI) classification. The VRI classes on BLM-managed lands in the decision area are displayed on Figure 3-17~~Figure 3-17~~, Visual Resource Inventory.

The VRI classes were used in previous land use planning to establish current VRM classes on BLM-managed lands are displayed in Figure 3-18~~Figure 3-18~~, Visual Resource Management; summarized in **Table 3-27**, Visual Resource Management Classes on BLM-Managed Lands. Acres in NPS management zones are in **Table 3-13**, Management Zones on NPS-Managed Lands, and displayed on Figure 3-8~~Figure 3-8~~, Management Zones.

Table 3-27
Visual Resource Management Classes on BLM-Managed Lands

Visual Resource Management Class	Acres[1]
VRM Class I	890,800
VRM Class II	609,200
VRM Class III	411,900
VRM Class IV	9,600

Source: BLM GIS 2014
[1]Acreage does not equal that of the decision area due to mapping errors

3.11.2 Trends

Few large-scale anthropogenic (human-made) modifications are permitted in GSENM and Glen Canyon, and the rugged topography throughout the decision area limits large-scale developments. Therefore, the overall visual character of the landscape is relatively static. Should the trend continue as in past decades, such modifications to livestock grazing as maintaining seedings{ XE "Seeding" } and constructing fences and corrals are likely to occur. These types of modifications can be implemented in a manner that meets VRM class objectives. In Glen Canyon, modifications associated with livestock grazing may also alter the landscape character; however, modifications would not be permitted to the degree that impairment would occur.

3.11.3 References

BLM (United States Department of the Interior, Bureau of Land Management). 1986. Handbook H-8431-1, Visual Resource Contrast Rating. Rel. 8-30. January 17, 1986. BLM, Washington, DC.

_____. 2000. Grand Staircase-Escalante National Monument Management Plan{ XE "Monument Management Plan, Grand Staircase-Escalante National Monument (MMP 2000)" } and Record of Decision. BLM, Grand Staircase-Escalante National Monument, Cedar City, Utah. February 2000.

_____. 2008a. Kanab Field Office Record of Decision and Approved Resource Management Plan. BLM, Kanab Field Office, Kanab, Utah. October 2008.

_____. 2008b. Arizona Strip Field Office Record of Decision and Resource Management Plan. BLM, Arizona Strip Field Office, St. George, Utah. February 2008.

Figure 3-17 Visual Resource Inventory

Figure 3-18 Visual Resource Management

BLM GIS. 2014. Base GIS data on file with BLM's eGIS Server, used for calculations or figures to support the MMP{ XE "Monument Management Plan, Grand Staircase-Escalante National Monument (MMP 2000)" }-A. BLM, Grand Staircase Escalante National Monument, Utah.

NPS (United States Department of the Interior, National Park Service). 2006. Management Policies. United States Department of the Interior, National Park Service. ISBN 0-16-076874-8.

3.12 WILDLAND FIRE MANAGEMENT

The Federal Wildland Fire Management Policy was developed by the secretaries of the Departments of the Interior and Agriculture in 1995 in response to dramatic increases in the frequency, size, and catastrophic nature of wildland fires in the US. The 2001 review and update of the 1995 Federal Wildland Fire Management Policy consists of findings, guiding principles, policy statements, and implementation actions. Known as the 2001 Federal Wildland Fire Management Policy (DOI et al. 2001), this update recommends that federal fire management activities and programs are to provide for firefighter and public safety, protect and enhance land management objectives and human welfare, integrate programs and disciplines, require interagency collaboration, emphasize the natural ecological role of fire, and contribute to ecosystem sustainability.

Wildland fire management is further guided by Fire Management Plans, which consider the three elements mentioned above as well as firefighter and public safety and cost effectiveness.
Wildland fires can occur from natural causes, such as lightning, or are caused by humans either accidentally or with the intent to cause damage. Wildland fire management practices include both the control of wildfires and the use of fire to meet land management goals. Prescribed fire is fire used for beneficial purposes (such as reducing hazardous fuel accumulation) in a controlled manner under a specific prescription and planned effort. Wildfires can be suppressed or managed to achieve land management objectives. The response to a wildland fire is based on an evaluation of risks to firefighter and public safety; the circumstances under which the fire has occurred, including weather and fuel conditions; natural and cultural resource management objectives; and resource protection priorities.

The natural (historical) fire regimes are classified based on average number of years between fires (fire frequency) combined with the severity (amount of replacement) of the fire on the dominant overstory vegetation. Understanding historical fire regimes, the fire return interval (frequency) and fire severity allows land managers to define ecologically appropriate goals and objectives for an area.
Indicators of wildland fire ecology and management can be summarized through fire regime and condition class classifications. Fire Regime groups are defined in **Table 3-X**, Fire Regime Groups, below.

Table 3-X
Fire Regime Groups

Group	Frequency	Severity	Severity Description
I	0-35 years	Low/mixed	Generally low-severity

Table 3-X
Fire Regime Groups

Group	Frequency	Severity	Severity Description
			fires replacing less than 25% of the dominant overstory vegetation; can include mixed-severity fires that replace up to 75% of the overstory
II	0-35 years	Replacement	High-severity fires replacing greater than 75% of the dominant overstory vegetation
III	35-200 years	Mixed/Low	Generally mixed-severity; can also include low-severity fires
IV	35-200 years	Replacement	High-severity fires
V	200+	Replacement / any severity	Generally, replacement-severity; can include any severity type in this frequency range

Source: Barrett et al 2000

While the fire regime of a particular area is not likely to change except in the very long term, the condition class can be changed through fire management and other vegetation management actions. Vegetation Condition Class (VCC) indicates the general level to which current vegetation is different from the historical vegetation reference conditions (Barrett et al. 2010).

The VCC classes are defined in classes VCC Ia to VCC IIIb, with VCC IIIb representing the highest degree of departure from historic conditions. Extreme departure from the historic conditions results in changes to one or more of the following ecological components: vegetation characteristics (species composition, structural stages, stand age, canopy closure, and mosaic pattern); fuel composition; fire frequency, severity, and pattern; and other associated disturbances (e.g., insect and disease mortality, grazing, and drought).

Table 3-X
Vegetative Condition Class Definition

VCC	Description	Risks
VCC Ia VCC Ib	Within the natural (historical) range of variability of vegetation characteristics	Composition and structure of vegetation and fuels are similar to the natural (historical) range at patch and landscape scale. Risk of loss of key ecosystem components (e.g. native species, large trees, and soil) are low.
VCC IIa VCC IIb	Moderate departure from the natural (historical) regime of vegetation characteristics	Composition and structure of vegetation and fuel are moderately altered. Risk of loss of key ecosystem components are moderate For example: Grasslands Moderate encroachment of shrubs and trees and/or invasive exotic species. Shrublands Moderate encroachment of trees, increased shrubs, or invasive exotic species. Forestland/Woodland Moderate increases in density, encroachment of shade tolerant tree species, or moderate loss of shade intolerant tree species caused by fire exclusion, logging, or exotic insects or disease. Replacement of surface shrub/grass with woody fuels and litter.
VCC IIIa VCC IIIb	High (VCC IIIa) to very high (VCC IIIb) departure from the natural (historical) regime of vegetation characteristics; fuel composition; fire frequency, severity and pattern; and other associated disturbance	Composition and structure of vegetation and fuel are highly altered. Risk of loss of key ecosystem components are high For example: Grasslands High encroachment and establishment of shrubs, trees, or invasive exotic species. Shrublands High encroachment and establishment of trees, increased shrubs, or invasive exotic species. Forestland/Woodland High increases in density, encroachment of shade tolerant tree species, or high loss of shade intolerant tree species caused by fire exclusion, logging, or exotic insects or disease.

Source: Barrett et al 2010

Table 3-X
Vegetative Condition Class Definition

VCC	Description	Risks

3.12.1 Current Conditions

A fire management plan was prepared for the southern Utah area in 2004 (BLM 2004). This plan covers lands of all ownership and provides overarching direction for the Southern Utah Management Area, with direction and objectives provided by fire management unit. Fire management units within the GSENM planning area are shown in **Figure 3.X,** Decision Area Vegetative Condition Class.

Limited acres have been burned in wildfires in the recent past, with only six named fires recorded. In the ten-year period between 2000 and 2010, approximately 3,510 aces, or less than one percent of the decision area burned in wildfires.

Table 3-X
Decision Area Acres Burned 2000-2010

Year	Fire Name	Acres Burned
2000	Pine Hollow	12
	Tank Hollow	724
2004	Sheep Fence	1,205
2006	Buckskin	1,436
	Davis	45
	Deer Creek	88
Total		3,510

Source: REA GIS 2010

Based on fire occurrence data in the decision area from 1980-2010, the majority of fires starts (649, or 86 percent of all fire starts) were from natural causes (see **Table 3.X**, Decision Area Fire Occurrence 1980-2010).

Table 3-X
Decision Area Fire Occurrence 1980-2010

Cause	Number of fire starts
Unknown	34
Human	73
Natural	649
Total	756

Table 3-X
Decision Area Fire Occurrence 1980-2010

Cause	Number of fire starts

Source: REA GIS 2010

A significant portion of the decision area (426,00 acres or 45 percent) is classified as barren or sparsely vegetated, with low potential to be impacted by natural or prescribed fire. The vegetated portion of the decision area is dominated by Fire Regime Group III (approximately 1,014,500 acres or 45 percent), which is characterized by a long return interval (35-200 years) and mixed/low severity fires.

Table 3-X
Decision Area Fire Regime

Fire Regime Group	Acres
Barren	359,200
Sparsely Vegetated	66,500
Water	600
Fire Regime Group I	73,300
Fire Regime Group II	0
Fire Regime Group III	1,014,500
Fire regime Group IV	375,700
Fire Regime Group V	352,700

Source: Landfire GIS 2014

[Insert Figure 3.X, Decision Area Fire Regimes]

Based on national level Landfire data, the majority of the decision area with vegetation is classified as VCC class Ib, with low variation from historical vegetative conditions (see **Table 3-X**, Decision Area Vegetative Condition Class and Figure 3-X, Decision Area Vegetative Condition Class). Landfire data may not be reflective of site specific conditions, where variation from historical conditions occurs within specific vegetation communites as described in **Section 3.2**, Vegetation.

Table 3-X
Decision Area Vegetative Condition Class

Vegetative Condition Class Category	Acres
Barren	359,200
Burnable Agriculture	70
Burnable Urban	2,400
Non burnable Agriculture	

Table 3-X
Decision Area Vegetative Condition Class

Vegetative Condition Class Category	Acres
	30
Non burnable Urban	4,000
Sparsely Vegetated	66,400
Vegetation Condition Class I.B	1,018,900
Vegetation Condition Class II.A	619,400
Vegetation Condition Class II.B	169,000
Vegetation Condition Class III.A	2,500

Source: Landfire GIS 2014

[Insert Figure 3.x, Decision Area Vegetative Condition Class]

3.12.2 Trends

The planning area has a history of wildland fire from natural and human causes. Activities in the region area that have impacted fire ignition include increased human presence in some areas, due to urbanization and roads, agriculture. In the decision area, however, natural causes are still the dominant source of ignition. At the site specific level, vegetation changes have impacted vegetative conditions and related fire size, fire intensity, and fire frequency. In some areas, invasive species, such as cheatgrass (*Bromus tectorum*) and other annual invasive grasses, are present. Cheatgrass is highly flammable and densely growing populations provide ample, fine-textured fuels that increase fire intensity and often decrease the intervals between fires (Zouhar 2003). In some areas, mechanical vegetation treatments to promote livestock forage or for other management objectives also affected vegetation communities and fire risks at the local level.

3.12.3 References

Barrett, S., D. Havlina, J. Jones, W. Hann, C. Frame, D. Hamilton, K. Schon, T. Demeo, L. Hutter, and J. Menakis. 2010. Interagency Fire Regime Condition Class Guidebook. Version 3.0. USDA Forest Service, US Department of the Interior, and The Nature Conservancy. Internet website: https://www.frames.gov/frcc

BLM. 2004. Southwest Utah Support Area Fire Management Plan. Cedar City Field Office. September 29, 2004. Ceder City, Utah.

Landfire GIS 2014

REA GIS 2010

US DOI. 2009. Guidance for implementation of federal wildland fire management policy. US Department of Agriculture and US Department of the Interior. Internet website: https://www.frames.gov/files/6313/6018/1559/Guidance_implementation_fed_fire_2009.pdf

Zouher, Kris. 2003. Bromus tectorum. In: Fire Effects Information System. US Department of Agriculture, Forest Service, Rocky Mountain Research Station, Fire Sciences Laboratory. Internet website: http://www.fs.fed.us/database/feis/plants/graminoid/brotec/all.html

~~3.12~~3.13 LANDS WITH WILDERNESS CHARACTERISTICS

This section discusses lands with wilderness characteristics on BLM-managed lands in the planning area. For BLM wilderness and WSAs and NPS proposed wilderness, see **Sections 3.1~~5~~4**, **3.16**, and **3.17**, respectively ~~BLM Wilderness Study Areas and NPS Recommended~~

Section 201(a) of FLPMA{ XE "Federal Land Policy and Management Act (FLPMA)" } directs the BLM to "prepare and maintain on a continuing basis an inventory of all public lands and their resources and other values… [T]his inventory is to be kept current so as to reflect changes in conditions and to identify new and emerging resource and other values."

~~3.12.1~~3.13.1 Current Condition

The original BLM nationwide wilderness inventory process, under Section 603 of FLPMA{ XE "Federal Land Policy and Management Act (FLPMA)" }, was supplemented by a subsequent reinventory of BLM-managed lands in Utah from 1996 to 1999. Based on this reinventory process, there are currently 471,700 acres in the decision area that contain wilderness characteristics. Wilderness characteristics are the following: size, naturalness, outstanding opportunities for solitude or primitive and unconfined recreation, and supplemental values (BLM 1999; see **Figure 3-19**~~Figure 3-19~~, Lands with Wilderness Characteristics). These wilderness characteristics are further described below.

- Size An area must be roadless, with 5,000 acres of contiguous BLM-managed lands. If an area is less than 5,000 acres, it must be contiguous with BLM-managed lands that have been formally determined to have wilderness or potential wilderness values, designated wilderness and WSAs. Alternatively, the area must be any federal lands managed for to protect wilderness characteristics, such as designated wilderness, USFWS areas proposed for wilderness designation, Forest Service WSAs or areas of recommended wilderness, and NPS areas recommended or proposed for designation.
- Naturalness Lands and resources that exhibit a high degree of naturalness when affected primarily by the forces of nature and where the imprint of human activity is substantially unnoticeable. An area's naturalness may be influenced by the presence or absence of roads or other developments, the nature and extent of landscape modifications, and the connectivity of habitats. Wildlife populations and habitat are recognized as important aspects of naturalness and would be managed as such.
- Outstanding opportunities for solitude or primitive and unconfined types of recreation Visitors may have outstanding opportunities for solitude or primitive

and unconfined types of recreation when the sights, sounds, and evidence of other people are rare or infrequent; where visitors can be isolated, alone, or secluded from others; where an area is accessed via nonmotorized non-mechanical means; and where no or minimal recreation facilities are encountered.

Figure 3-19 Lands with Wilderness Characteristics

1

- Supplemental values The area may contain ecological, geological, or other features of scientific, educational, scenic, or historic value.

Potential impacts on these areas, now referred to as lands with wilderness characteristics, are required to be addressed in any NEPA{ XE "National Environmental Policy Act (NEPA)" } analysis, as directed by BLM Manual 6320, Consideration of Lands with Wilderness Characteristics in the BLM Land Use Planning Process (BLM 2012).

The MMP{ XE "Monument Management Plan, Grand Staircase-Escalante National Monument (MMP 2000)" } did not specifically address management of lands with wilderness characteristics. However, lands with wilderness characteristics receive incidental management as part of the management zones.

Most lands with wilderness characteristics are in the primitive zone (281,800 acres) and outback zone (149,600 acres; see **Section 3.5.1**, Recreation, for a complete description of the management zones; BLM GIS 2014). The primitive zone allows for an undeveloped, primitive, and self-directed visitor experience without mechanized or motorized access (BLM 2000). The outback zone is intended for an undeveloped, primitive, and self-directed visitor experience, while allowing motorized and mechanized access on designated routes. Facilities are rare and are provided only when needed for resource protection (BLM 2000).

The remaining lands with wilderness characteristics are in the front country and passage zones of the Monument. These zones contain more facilities and are the focal points for visitation.

~~3.12.2~~3.13.2 Trends

While the MMP{ XE "Monument Management Plan, Grand Staircase-Escalante National Monument (MMP 2000)" } did not make specific decisions on the management of lands with wilderness characteristics, the management prescriptions associated with the primitive and outback zones generally help to maintain or enhance the wilderness characteristics (i.e., size, naturalness, and opportunities for solitude or primitive and unconfined recreation) in GSENM. They provide for an undeveloped, primitive, and nonmotorized and nonmechanized experience, Because of this, these characteristics are expected to persist even with the lack of direct management prescriptions for lands with wilderness characteristics.

Where lands with wilderness characteristics are in the front country or passage zone, developments needed to accommodate visitation could locally impact naturalness. And, because these areas are more visited than areas in the outback and primitive zones, opportunities for solitude may also be reduced.

~~On lands with wilderness characteristics, there are paved public roadways and unpaved public~~

BLM (United States Department of the Interior, Bureau of Land Management). 1999. Utah Wilderness Inventory. December 31, 1999. Internet website: http://www.gpo.gov/fdsys/pkg/GPO-DOI-BLM-UTAH99/pdf/GPO-DOI-BLM-UTAH99.pdf.

_____. 2012. Manual 6320, Consideration of Lands with Wilderness Characteristics in the BLM Land Use Planning Process. BLM, Washington, DC. Rel. 6-130. March 15, 2012.

BLM GIS. 2014. Base GIS data on file with BLM's eGIS Server, used for calculations or figures to support the MMP{ XE "Monument Management Plan, Grand Staircase-Escalante National Monument (MMP 2000)" }-A. BLM, Grand Staircase Escalante National Monument, Utah.

~~3.13~~3.14 WILD AND SCENIC RIVERS

Wild and scenic rivers (WSRs) are streams or segments of streams designated by Congress under the authority of the Wild and Scenic Rivers Act of 1968 (Public Law 90-542, as amended; 16 USC 1271-1287). Their purposes are to preserve the stream or stream section in its free-flowing condition, to preserve water quality, and to protect its outstandingly remarkable values (ORVs). ORVs are identified on a segment-specific basis and may include scenic, recreational, geological, fish and wildlife, historic, cultural, and other similar values.

Section 5(d)(1) of the Wild and Scenic Rivers Act directs federal agencies to consider potential WSRs in their land and water planning process. To fulfill this requirement, the BLM evaluated streams in GSENM when preparing the MMP{ XE "Monument Management Plan, Grand Staircase-Escalante National Monument (MMP 2000)" }.

The WSR study process is composed of an eligibility phase and a suitability phase. During the eligibility phase, stream segments are evaluated to determine whether they meet the criteria of being free-flowing and possess one or more ORVs, as defined in the Wild and Scenic Rivers Act. Eligible segments are then given a tentative classification as wild, scenic, or recreational, based on water quality and level of human development in the study corridor.

Stream segments found to be eligible for inclusion in the National Wild and Scenic Rivers System (NWSRS) are carried forward to the suitability phase of the study process. During the suitability phase, criteria are evaluated to consider tradeoffs between stream corridor use and stream protection.

~~3.13.1~~3.14.1 Current Conditions

In GSENM, there are 240 miles of suitable WSR segments. Figure 3-20~~Figure 3-20~~, Special Designations, displays the suitable WSR segments. **Table 3-28**, Suitable Wild and Scenic River Segments in GSENM, summarizes the length, classification and ORVs of each WSR segment in GSENM. There are no eligible, suitable, or designated rivers outside of GSENM.

In GSENM, the Escalante River is unavailable for livestock grazing as are several of the tributaries feeding the Escalante River. For the Escalante River drainage basin, 81 percent (85 miles) of all suitable segments are unavailable for livestock grazing. All stream segments in the Paria River drainage basin are available for grazing. In total, there are 85 miles (35 percent) of suitable stream segments that are unavailable for grazing. The BLM manages the remaining segments, 88 percent of which are in the Paria River drainage basin, as available for grazing (BLM 2000).

Figure 3-20 Special Designations

Table 3-28
Suitable Wild and Scenic River Segments in GSENM

Segment	Length (on BLM-Managed Land)[1]	Classification	Outstandingly Remarkable Values
Escalante River System			
Escalante River-1	13.4	Wild	Scenery; geology; wildlife; history; recreation; fish; culture; other[2]
Escalante River-2	0.3	Recreational	Scenery; geology; wildlife; history; recreation; fish; culture; other
Escalante River-3	19.5	Wild	Scenery; geology; wildlife; history; recreation; fish; culture; other
Harris Wash	1.1	Wild	Scenery; wildlife; history; recreation; culture; other
Lower Boulder Creek	13.5	Wild	Scenery; recreation; culture; other
Slickrock Canyon	2.8	Wild	Scenery; recreation; culture; other
Lower Deer Creek-1	2.1	Recreational	Scenery; wildlife; recreation; culture; other
Lower Deer Creek-2	7.0	Wild	Scenery; wildlife; recreation; culture; other
The Gulch-1	11.0	Wild	Scenery; recreation; culture
The Gulch-2	0.6	Recreational	Scenery; recreation; culture
The Gulch-3	13.0	Wild	Scenery; recreation; culture
Steep Creek	6.0	Wild	Scenery; recreation; other
Lower Sand Creek and tributary Willow Patch Creek	10.6	Wild	Scenery; wildlife; history; fish; other
Mamie Creek and west tributary	9.2	Wild	Scenery; geology; wildlife; history; recreation; fish; culture; other
Death Hollow Creek	9.9	Wild	Scenery; wildlife; recreation; culture; other
Calf Creek-1	3.5	Wild	Scenery; wildlife; recreation; culture; other
Calf Creek-2	3.0	Scenic	Scenery; wildlife; recreation; culture; other
Calf Creek-3	1.5	Recreational	Scenery; wildlife; recreation; culture; other
Twenty-five Mile Wash	6.8	Wild	Scenery; geology; wildlife; recreation; culture; other
Paria River System			
Upper Paria River-1	21.7	Wild	Scenery; geology; history; recreation
Upper Paria River-2	14.3	Recreational	Scenery; geology; history; recreation
Lower Paria River-1	1.2	Recreational	Scenery; geology; recreation
Lower Paria River-2	4.3	Wild	Scenery; geology; recreation

Table 3-28
Suitable Wild and Scenic River Segments in GSENM

Segment	Length (on BLM-Managed Land)[1]	Classification	Outstandingly Remarkable Values
Deer Creek Canyon	5.2	Wild	Scenery; geology; recreation; culture
Snake Creek	4.7	Wild	Scenery; geology; history; recreation
Hogeye Creek	6.3	Wild	Scenery; geology; history; recreation
Kitchen Canyon	1.3	Wild	Scenery; geology; history; recreation
Starlight Canyon	4.9	Wild	Scenery; geology; history; recreation
Lower Sheep Creek	1.5	Wild	Scenery; recreation
Hackberry Creek	20.1	Wild	Recreation; wildlife; other
Lower Cottonwood Creek	1.6	Wild	Recreation; wildlife; other
Buckskin Gulch/Wire Pass	15.2	Wild	Scenery; geology; recreation

Source: BLM GIS 2014
[1] Segment lengths may differ from the MMP{ XE "Monument Management Plan, Grand Staircase-Escalante National Monument (MMP 2000)" } due to updated GIS data since the adoption of the MMP.
[2] Other could include paleontological, botanical, or hydrological resources or stream segments that are important for scientific study.

~~3.13.2~~3.14.2 References

BLM (United States Department of the Interior, Bureau of Land Management). 2000. Grand Staircase-Escalante National Monument Management Plan{ XE "Monument Management Plan, Grand Staircase-Escalante National Monument (MMP 2000)" } and Record of Decision. BLM, Grand Staircase-Escalante National Monument, Cedar City, Utah. February 2000.

BLM GIS. 2014. Base GIS data on file with BLM's eGIS Server, used for calculations or figures to support the MMP{ XE "Monument Management Plan, Grand Staircase-Escalante National Monument (MMP 2000)" }-A. BLM, Grand Staircase Escalante National Monument, Utah.

~~3.14~~3.15 BLM WILDERNESS~~, WILDERNESS STUDY AREAS, AND NPS PROPOSED WILDERNESS~~

In 1964, Congress passed the Wilderness Act, thereby establishing a national system of lands for the purpose of preserving a representative sample of ecosystems in a natural condition for the benefit of future generations. ~~To be considered for Wilderness designation, land must have the following five characteristics of Wilderness outlined in the Wilderness Act:~~

- ~~Untrammeled—The earth and its community of life are untrammeled by humans, where humans are visitors and do not remain.~~

Formatted: Level 4

- ~~Natural—The area is protected and managed so as to preserve its natural conditions.~~

- ~~Undeveloped. The area is undeveloped and retains its primeval character and influence.~~

BLM wilderness areas are managed to preserve their wilderness character according to the Wilderness Act (PL 88-577, 16 USC 1131-1136) and BLM regulations at 43 CFR 6300, Management of Designated Wilderness Areas, and, with respect to livestock grazing, at 43 CFR 6304.25. Facilities maintenance and construction must be conducted in accordance with Appendix A of the Committee on Interior and Insular Affairs of the House of Representatives accompanying HR 2570 of the 101st Congress (commonly called the Congressional Wilderness Grazing Guidelines). BLM policies for managing designated wilderness to preserve wilderness character are in BLM Manual 6340, Management of Designated Wilderness Areas (BLM 2012). Management is further guided by the legislation designating the wilderness area and subsequent management plans for the area. The Paria Canyon-Vermilion Cliffs Wilderness in the decision area was designated by the Arizona Wilderness Act of 1984 (PL 98-406). Administrative management for Paria Canyon-Vermilion Cliffs Wilderness is in the Paria Canyon-Vermilion Cliffs Wilderness Management Plan (BLM 1984).

The BLM manages wilderness to preserve the following five distinct and tangible wilderness character qualities, which are taken from Section 2(c) of the Wilderness Act: Definition of Wilderness:

- *Untrammeled*. The Wilderness Act states that wilderness is "an area where the earth and its community of life are untrammeled by man." A "trammel" is literally a net, snare, hobble, or other device that impedes the free movement of an animal. Here, used metaphorically, "untrammeled" refers to wilderness as essentially unhindered and free from modern human control or manipulation. This quality is impaired by human activities or actions that control or manipulate the components or processes of ecological systems inside wilderness.
- *Natural*. The Wilderness Act states that wilderness is "protected and managed so as to preserve its natural conditions." In short, wilderness ecological systems should be as free as possible from the effects of modern civilization. Management must foster a natural distribution of native wildlife, fish, and plants by ensuring that ecosystems and ecological processes continue to function naturally. Watersheds, water bodies, water quality, and soils are maintained in a natural condition; associated ecological processes previously altered by human influences will be allowed to return to their natural condition. Fire, insects, and diseases are allowed to play their natural role in the wilderness ecosystem except where these activities threaten human life, property, or high value resources on adjacent non-wilderness lands. This quality may be affected by intended or unintended effects of human activities on the ecological systems inside the wilderness.
- *Undeveloped*. The Wilderness Act states that wilderness is an area "of undeveloped Federal land retaining its primeval character and influence, without permanent improvements or human habitation," "where man himself is a visitor who does not remain," and "with the imprint of man's work substantially unnoticeable." Wilderness has minimal evidence of modern human occupation or modification. This quality is impaired by the presence of structures or installations, and by the use

of motor vehicles, motorized equipment, or mechanical transport that increases people's ability to occupy or modify the environment.

- *Solitude or Primitive and Unconfined Recreation*. The Wilderness Act states that wilderness has "outstanding opportunities for solitude or a primitive and unconfined type of recreation." Wilderness provides opportunities for people to experience: natural sights and sounds; remote, isolated, unfrequented, or secluded places; and freedom, risk, and the physical and emotional challenges of self-discovery and self-reliance. Any one wilderness does not have to provide all these opportunities, nor is it necessary that they be present on every acre of a given wilderness. Where present, however, the preservation of these opportunities is important to the preservation of wilderness character as a whole. This quality is impaired by settings that reduce these opportunities, such as visitor encounters, signs of modern civilization, recreation facilities, and management restrictions on visitor behavior.
- *Unique, Supplemental, or Other Features*. The Wilderness Act states that wilderness areas "may also contain ecological, geological, or other features of scientific, educational, scenic, or historical value." Though these values are not required of any wilderness, where they are present they are part of that area's wilderness character, and must be protected as rigorously as any of the four required qualities. They may include historical, cultural, paleontological, or other resources not necessarily considered a part of any of the other qualities. These values are identified in a number of ways: in the area's designating legislation, through its legislative history, by the original wilderness inventory, in a wilderness management plan, or at some other time after designation. (BLM 2012)

~~3.14.1~~3.15.1 Current Conditions

~~*BLM Wilderness and Wilderness Study Areas*~~

Cliffs Wilderness (BLM GIS 2014). See **Figure 3-20**~~**Figure 3-20**~~, Special Designations.

According to the enabling legislation for Paria Canyon-Vermilion Cliffs Wilderness Area (Arizona Wilderness Act of 1984; PL 98-406) and where it was established before the wilderness area designation, livestock are allowed to continue grazing in the same locations and at the intensity as they did at the time of enactment (August 28, 1984); however, their numbers are not allowed to increase (BLM 1984). The construction of new range improvements will be for resource protection and management (BLM 1984).

There are improvements in the wilderness area that existed at the time of enactment (August 28, 1984) including fences, stock ponds, spring developments, and pipelines~~, stock ponds,~~ maintained or reconstructed. The maintenance of such improvements{ XE "Range Improvement" } can influence the natural and undeveloped wilderness character, even though they are allowed. New improvements to support livestock grazing will not be authorized.

~~3.14.2~~3.15.2 References

BLM (United States Department of the Interior, Bureau of Land Management). 1984. Paria Canyon-Vermilion Cliffs Wilderness Management Plan. Coconino County, Arizona, and Kane County, Utah.

______. 2012. Manual 6340 Management of Designated Wilderness. Rel. 6-135. BLM, Washington, DC. July 13, 2012.

BLM GIS. 2014. Base GIS data on file with BLM's eGIS Server, used for calculations or figures to support the MMP{ XE "Monument Management Plan, Grand Staircase-Escalante National Monument (MMP 2000)" }-A. BLM, Grand Staircase Escalante National Monument, Utah.

3.16 BLM Wilderness Study Areas

With the passage of the FLPMA{ XE "Federal Land Policy and Management Act (FLPMA)" } in 1976, Congress directed the BLM to inventory, study, and recommend which public lands under its administration should be designated wilderness. The wilderness inventory was conducted on a state-by-state basis from 1978 to 1980. The inventory focused on roadless areas of public lands of 5,000 acres or more and on roadless islands, but also included areas of less than 5,000 acres if certain criteria were met.

When wilderness characteristics, as defined by Section 2(c) of the Wilderness Act of 1964 (16 USC 1131), were found within a defined boundary, the presence of the wilderness resource was documented and the area was classified as a WSA. All values, resources, and uses occurring in each WSA were analyzed through legislative EISs. When completed, recommendations as to the suitability or unsuitability of each WSA for designation as wilderness were submitted to the President through the Secretary of the Interior and then to Congress. The FLPMA{ XE "Federal Land Policy and Management Act (FLPMA)" } required that the reports be submitted to the President by October 21, 1991, and to Congress by October 21, 1993 (43 USC 1782[a]-[b]).

In the 2003 Settlement Agreement (*Utah v. Norton*), the BLM agreed that the agency's authority to conduct wilderness reviews under Section 603(a) of FLPMA{ XE "Federal Land Policy and Management Act (FLPMA)" } expired in 1993. Following expiration of the Section 603(a) process, there is no general legal authority for the BLM to designate lands as WSAs for management, pursuant to the non-impairment standard prescribed by Congress for Section 603 WSAs. FLPMA land use plans completed after April 14, 2003, neither designate any new WSAs nor manage any additional lands under the Section 603(a) non-impairment standard.

Only Congress can decide which areas, if any, will be designated as wilderness and added to the National Wilderness Preservation System. Until Congress acts on the recommendations and either designates them as wilderness or releases them for other uses, the FLPMA{ XE "Federal Land Policy and Management Act (FLPMA)" } mandates the BLM to manage WSAs "in a manner so as not to impair the suitability of such areas for preservation as wilderness…" (43 USC 1782[c]). BLM policy to achieve this mandate is found in BLM Manual 6330, Management of Wilderness Study Areas (BLM 2012). Should Congress release any of the WSAs from wilderness consideration, they would be managed according to FLPMA and the applicable management zone and other prescriptions in the MMP{ XE "Monument Management Plan, Grand Staircase-Escalante National Monument (MMP 2000)" } (BLM 2000, p. 62).

The BLM has the responsibility to review all proposals for uses and facilities in WSAs to ascertain whether the proposal would impair its suitability for preservation as wilderness. The

nonimpairment standard is based on whether the use/facility is temporary or whether the use/facility will not create new surface disturbances.

There are seven classes of allowable exceptions to the nonimpairment standard: emergencies, public safety, restoration of impacts from violations and emergencies, valid existing rights, grandfathered uses, protection or enhancement of wilderness characteristics or values, and other legal requirements. According to BLM Manual 6330, grandfathered uses include pre-existing uses, such as livestock grazing, mining, and mineral leasing, that were allowed prior to the enactment of FLPMA{ XE "Federal Land Policy and Management Act (FLPMA)" } on October 21, 1976. In GSENM, grazing is considered a grandfathered use.

In accordance with FLPMA, Manual 6330, and the Wilderness Act, grazing is allowed to continue in ~~wilderness areas and~~ WSAs. Pre-FLPMA livestock developments (range improvements) may and maintained in the same manner and to the same degree as such use was being conducted on October 21, 1976. New range improvements may only be approved if they meet the nonimpairment standard or one of the exceptions to the nonimpairment standard. The nonimpairment standard states that the use or facility must be temporary and cannot create new surface disturbance. If new range improvements meet the standard, they can be allowed. Grazing use can also be increased in WSAs beyond what was permitted on October 21, 1976, provided that such use meets the nonimpairment standard or one of the exceptions. Grazing in WSAs is also subject to BLM policies. Grazing can be reduced in WSAs if, for example, the rangeland is failing to achieve standards for rangeland health and grazing management practices are determined to be the significant causal factor (BLM 2012). The nonimpairment standard is described in detail in BLM Manual 6330, Section 1.6.C (page 1-10; BLM 2012). Policies for grazing management in WSAs are described in BLM Manual 6330, Section 1.6.D.3 (page 1-16; BLM 2012). ~~in the same manner and degree as it occurred on October 21, 1976, when the WSA~~

~~3.14.3~~3.16.1 Current Conditions

There are ~~also~~ 17 WSAs in the planning area, totaling approximately 881,300 acres, or about 39 percent of BLM-managed land in the planning area (see **Table 3-29**, Wilderness Study Areas and Instant Study Areas, and **Figure 3-20**~~**Figure 3-20**~~, Special Designations){ XE "Instant Study BLM manages WSAs to protect wilderness characteristics, as described in Section 2(c) of the Wilderness Act.

In the WSAs, there are nonstructural range improvements{ XE "Range Improvement" } (seedings{ XE "Seeding" }) on 4,600 acres[30] (see **Figure 3-21**, Seedings within WSAs); structural range improvements in WSAs are corrals, dams, small reservoirs, troughs, fencing, and pipes. Nonstructural range improvements for forage production (historical seedings) were all originally done by mechanical means, primarily chaining. They also used nonnative seed, either crested wheatgrass or Russian wildrye. These structural and nonstructural range improvements are grandfathered uses and may continue to be used and maintained in the same manner and to

[30] Most of the 4,600 acres of seedings in WSAs are rehabilitation treatments for fire, for example the treatment in the Lake allotment, or oil exploration sites and not historical seedings for livestock forage. On **Figure 3-21**, those seedings on the edges of WSAs are more likely to be historical seedings for livestock forage and those seedings in more central portions of WSAs are more likely to be rehabilitation treatments.

the same degree as such use was being conducted on October 21, 1976, prior to FLPMA{ XE "Federal Land Policy and Management Act (FLPMA)" } and the creation of any WSAs. In other words, they can have the same, but not more, physical or visual

Table 3-29
Wilderness Study Areas and Instant Study Areas{ XE "Instant Study Area" }

WSA/ISA	Acres
Burning Hills WSA	62,500
Carcass Canyon WSA	47,400
Death Ridge WSA	62,400
Devil's Garden ISA	600
Escalante Canyons Tract 1 ISA	400
Escalante Canyons Tract 5 ISA	800
Fiftymile Mountain WSA	148,500
Mud Spring{ XE "Spring" } Canyon WSA	38,200
North Escalante Canyons/The Gulch ISA	119,200
Paria/Hackberry WSA	136,800
Paria/Hackberry 202 WSA	400
Phipps-Death Hollow ISA	42,800
Scorpion WSA	36,000
Steep Creek WSA	22,100
The Blues WSA	18,800
The Cockscomb WSA	9,900
Wahweap WSA	133,900
Total	**881,300**

Source: BLM GIS 2014

impact as they did at that time (BLM 2012). The maintenance of such improvements, particularly nonstructural range improvements{ XE "Range Improvement" }, can influence the naturalness of an area, even though they are allowed as a grandfathered use.

FOIA001:01673156

Figure 3-21 Seedings within WSAs

~~3.15~~3.16.3 References

Formatted: Heading 3

DOI-2019-10 02058

BLM (United States Department of the Interior, Bureau of Land Management). 2000. Grand Staircase-Escalante National Monument Management Plan{ XE "Monument Management Plan, Grand Staircase-Escalante National Monument (MMP 2000)" } and Record of Decision. BLM, Grand Staircase-Escalante National Monument, Cedar City, Utah. February 2000.

______. 2012. Manual 6330 Management of Wilderness Study Areas. Rel. 6-134. BLM, Washington, DC. July 13, 2012.

BLM GIS. 2014. Base GIS data on file with BLM's eGIS Server, used for calculations or figures to support the MMP{ XE "Monument Management Plan, Grand Staircase-Escalante National Monument (MMP 2000)" }-A. BLM, Grand Staircase Escalante National Monument, Utah.

~~3.16~~3.17 NPS Proposed Wilderness

The Act of Congress that established Glen Canyon required a wilderness review, in accordance with Subsections 3(c) and 3(d) of the 1964 Wilderness Act. Following a suitability study, the NPS identified areas suitable for wilderness designation and prepared an associated Wilderness Recommendation (NPS 1980). The agency identified 588,855 acres of Glen Canyon as suitable for designation, with 48,955 acres identified as potential additions. Of these acres, 209,600 are in the planning area (NPS GIS 1999; Figure 3-20~~Figure 3-20~~, Special Designations).

The NPS has the following categories of wilderness lands to identify where the lands are in the assessment process:

- Wilderness Studies The NPS will formally study Lands and waters found to possess the characteristics and values of wilderness, as defined in the Wilderness Act and determined eligible under the wilderness eligibility assessment. The NPS will use the study to develop its recommendation to Congress for wilderness designation.
- Potential Wilderness A wilderness study may identify lands that are surrounded by or are next to lands proposed for wilderness designation but that do not themselves qualify for immediate designation, due to temporary nonconforming or incompatible conditions. The wilderness recommendation that the President forwards to Congress may identify these lands as potential wilderness for future designation when the nonconforming use has been removed or eliminated.
- Proposed Wilderness The Director of the NPS will review the findings and conclusions of a formal wilderness study. The Director will then determine which lands will be forwarded to the Secretary of the Department of the Interior as proposed wilderness.
- Recommended Wilderness The Secretary of the Interior is responsible for recommending to the President those lands under the department's jurisdiction that are suitable or unsuitable for wilderness preservation. The Secretary performs this function through the Assistant Secretary's Office by reviewing NPS-proposed

wilderness and either approving or revising the proposal. The final result is forwarded by the Secretary for the President's consideration.

- Designated Wilderness After the President's wilderness recommendation is formally sent to and considered by Congress, Congress may subsequently enact the legislation to include the area wilderness preservation as designated or potential wilderness (NPS Management Policies 2006).

~~Currently, Glen Canyon wilderness lands fall under the proposed wilderness category. All of the~~

The NPS manages wilderness to preserve the following five distinct and tangible wilderness character qualities, which are taken from Section 2(c) of the Wilderness Act: Definition of Wilderness:

- Natural Wilderness ecological systems are substantially free from the effects of modern civilization. This quality is preserved or improved, for example, by controlling or removing nonindigenous species or restoring ecological processes. This quality is degraded by the loss of indigenous species, the occurrence of nonindigenous species, the alteration of such ecological processes as water flow and fire regimes, and the effects of climate change.
- Untrammeled Wilderness is essentially unhindered and free from the intentional actions of modern human control or manipulation. This quality is influenced by any activity or action that intentionally controls or manipulates the components or processes of ecological systems inside wilderness. It is supported or preserved when such management actions are not taken. It is degraded when such management actions are taken, even when these actions are intended to protect resources, such as spraying herbicides to eradicate or control nonindigenous species, or reducing fuels accumulated from decades of fire exclusion.
- Solitude or a Primitive and Unconfined Type of Recreation Wilderness provides outstanding opportunities for solitude or primitive and unconfined recreation. This quality is primarily about the opportunity for people to experience wilderness and is influenced by settings that affect these opportunities. This quality is preserved or improved by management actions that reduce visitor encounters, signs of modern civilization inside wilderness, and agency-provided recreation facilities. It also restricts visitor behavior. In contrast, this quality is degraded by management actions that increase these factors.
- Undeveloped Wilderness retains its primeval character and influence and is essentially without permanent improvement or modern human occupation. This quality is influenced by what are commonly called the "Section 4l prohibited uses" or "nonconforming" uses, which are the presence of modern structures, installations, and habitations and the use of motor vehicles, motorized equipment, or mechanical transport. This quality is preserved by the absence of structures and installations. It is degraded by the presence of structures and by prohibited uses, whether by the agency for administrative purposes, by others authorized by the agency, or by unauthorized users.

- Other Features of Value   Wilderness preserves other tangible features that are of scientific, educational, scenic, or historic value. This quality is based on the last clause of Section 2l of the Wilderness Act which states that a wilderness "may also contain ecological, geological, or other features of scientific, educational, scenic, or historical value." This quality captures important elements of the wilderness that may not be covered in the other four qualities, such as cultural or paleontological resources{ XE "Paleontological Resource" }. The quality is preserved or improved when these resources are preserved and their loss or impacts on such features degrade this quality of wilderness character (NPS 2014)

Proposed wilderness is managed per NPS Managmenet Policies and Director's Order #41: Wilderness Stewardship. All management decisions affecting wilderness must be consistent with the minimum requirement concept. A minimum requirement analysis is performed to determine whether an administrative action, project, or program is necessary and, if so, how to minimize impacts on the wilderness character qualities. Prohibited uses, as defined by the Wilderness Act Section 41, include the creation of permanent roads, the landing of aircraft, the use of motorized or mechanical transportation or tools, and the installation of permanent structures. All prohibited uses are similarly analyzed to ensure that they are minimum requirements necessary for administering the area as wilderness.

~~3.17~~3.17.1 Current Conditions

In the Glen Canyon portion of the planning area, there are 209,600 acres of proposed wilderness (NPS GIS 1999; **Table 3-30**, NPS-Proposed Wilderness Areas; **Figure 3-20**~~Figure~~ Following a suitability study, the NPS identified these areas as suitable for wilderness designation and prepared an associated wilderness recommendation (NPS 1980). To date, there has been no formal designation. Until such time as the lands are designated or are released from consideration, the NPS will manage the areas as wilderness to protect their wilderness character. Wilderness character is defined as "the combination of biophysical, experiential, and symbolic ideals that distinguishes wilderness from other lands" (USDA 2008).

Table 3-30
NPS-Proposed Wilderness Areas

Proposed Wilderness Unit	Total Acres	Acres in Planning Area
Escalante	280,900	149,800
Kaiparowits	59,800	59,800

Source: NPS GIS 1999

Most the proposed wilderness areas in Glen Canyon are along the Escalante River in the eastern and southeastern portions of the Planning Area. The proposed wilderness area extends to the west as far as Rock Creek.

~~3.17.1~~3.17.2 References

NPS (United States Department of the Interior, National Park Service). 1980. Wilderness Recommendation: Glen Canyon Recreation Area, Arizona and Utah.

______. 2014. Keeping It Wild in the National Park Service: A Users Guide to Integrating Wilderness Character into Park Planning, Management, and Monitoring. Lakewood, Colorado.

NPS GIS. 1999. GIS data of eligible wilderness areas. Received via e-mail from the NPS.

USDA (United States Department of Agriculture). 2008. Keeping It Wild: An Interagency Strategy to Monitor Trends in Wilderness Character Across the National Wilderness Preservation System. Gen. Tech. Rep. RMRS-GTR-212. Fort Collins, Colorado.

3.18 Tribal Interests

The BLM is mandated to consult with Native American tribes concerning the identification of their cultural values, religious beliefs, and traditional practices that may be affected by actions on federal lands. Consultation also takes into account TCPs{ XE "Traditional Cultural Property (TCP)" } and sites of tribal importance.

The 2000 MMP{ XE "Monument Management Plan, Grand Staircase-Escalante National Monument (MMP 2000)" } provides guidance relating to tribal interests (CNA-1 and CNA-2), and the BLM has policies, manuals, and handbooks for consulting with Native American groups and evaluating cultural resources and traditional use values. BLM Manual 8160, Native American Coordination and Consultation (BLM 1990), and BLM Handbook H-8120-1, Guidelines for Conducting Tribal Consultation (BLM 2004d), provide consultation requirements and procedural guidance to ensure that the consultation record demonstrates "that the responsible manager has made a reasonable and good faith effort to obtain and consider appropriate Native American input in decision making" (BLM 1994b). BLM Handbook H-8110, Identifying and Evaluating Cultural Resources (BLM 2004b), offers guidelines for determining authorized uses of a cultural resource, including considerations for traditional use values.

As part of the cultural resource management planning program, GSENM and Glen Canyon have initiated consultation with tribal governments of the Kaibab Paiute Tribe, Paiute Tribe of Utah, Navajo Nation, San Juan Southern Paiute Tribe, Hopi Tribe, Pueblo of Zuni, Ute Mountain Ute Tribe, Ute Tribe of the Uintah and Ouray Reservation, and the Hualapai Tribe. The BLM also contacted the Bureau of Indian Affairs requesting its input during the scoping period.

The initial outreach to tribal governments and cultural resource staff included invitations to participate as consulting parties, to initiate Section 106 consultation, and to request their input during the scoping period. Hopi and Kaibab Paiute tribes responded to the BLM's letters noting their concerns and requests to continue as consulting parties. The Hopi Tribe responded requesting continued consultation and noted their concerns with grazing-related impacts on cultural resources. They stated their support for the long-term elimination of grazing on GSENM. The Kaibab Paiute voiced their concerns about possible adverse effects on Native American sites and stated their preference for the "No Grazing" alternative.

3.18.1 Current Conditions

Tribal interests and traditional cultural resources are identified primarily through consultations with federally recognized Indian tribes on a government-to-government basis. There is no comprehensive list of all Indian trust assets for tribes or individual Indians. If needed, further

information on the nature of the trust asset can be determined by examining government documents, such as treaties, court decisions, water rights adjudication proceedings, and proclamations to establish reservations; however, there are no known Native American trust or treaty right obligations within the planning area.

Present practices to protect tribal interests are limited to project and site-specific Native American consultations. Tribal leaders and historians generally view the process of consultation in its entirety as one in which representatives of sovereign nations meet to discuss and resolve potential conflicts. From tribal perspectives, most issues center on the appropriate use and protection of landscapes and places. The BLM's approach has been far narrower and emphasizes specific sites, with the goal of protecting tribal interests in the framework of various cultural resources, as defined in **Section 3.9**, Cultural Resources. These are such resources as archaeological sites, TCPs{ XE "Traditional Cultural Property (TCP)" }, and other properties.

Some of these locations may also be regarded as sacred by particular Native American tribes or individuals. Under the framework of existing laws, including the NHPA{ XE "National Historic Preservation Act (NHPA)" }, AIRFA{ XE "American Indian Religious Freedom Act (AIRFA)" }, Executive Order 13007 regarding Indian Sacred Sites, and NAGPRA{ XE "Native American Graves Protection and Repatriation Act (NAGPRA)" }, the BLM must take into account the effects of federally linked projects or land uses on these types of locations.

3.18.2 Trends

As noted for cultural resources, trends measure the rate of change to tribal interests and resources over time. Essentially, trends track changes that are effectively altering the integrity or physical condition of resources, both beneficially and adversely. Although an important level-of-effect indicator, change is often difficult to estimate. Information is gathered based on BLM and NPS information provided from tribal consultations, keeping the focus on the resources likely affected by the actions and in locations where affects are likely to occur.

3.19 Socioeconomics

This section summarizes the Socioeconomic Baseline Report (BLM 2015), which is an overview of the social and economic conditions in the three-county socioeconomic study area: Coconino County, Arizona, and Garfield and Kane Counties, Utah. The Socioeconomic Baseline Report was prepared to document the socioeconomic setting for GSENM and Glen Canyon and to inform the socioeconomic context for this planning-level amendment and associated EIS.

The full report includes a detailed overview of the study area as a whole, plus additional detailed discussion for each of the three counties in the study area. It includes a discussion of potentially affected communities and groups of people, the cultural context, social conditions, and economic conditions, including both market and nonmarket values.

Although this section summarizes the major aspects of the report, readers are encouraged to review the full Socioeconomic Baseline Report, which is available online at http://www.blm.gov/style/medialib/blm/ut/grand_staircase-escalante/planning/livestock_eis0/socioeconomic.Par.37487.File.dat/2015%2007%2030_SocioeconomicBaselineStudyFINAL_508.pdf.

3.19.1 Current Conditions

Sources of Socioeconomic Data

Data included in the Socioeconomic Baseline Report were derived from multiple sources. Most of the data was provided by individual and multiple county reports generated from the Economic Profile System (EPS), a socioeconomic data compilation and analysis software program maintained by Headwaters Economics, a nonprofit research organization. The development of the EPS program was funded by the BLM, the Forest Service, and other public entities.

EPS reports are based on data from multiple federal and non-federal sources, including the US Census Bureau, the Bureau of Economic Analysis, the USDA Economic Research Service, the Bureau of Labor Statistics, the Office of Management and Budget, industry data sources, and more.[31] Additional data sources used in the report are the BLM archives, information provided by local officials and agricultural producers in the study region, and local BLM employees.

The socioeconomic analysis presents unique challenges in the land use planning setting, due to the nature of the available data. Socioeconomic data are gathered by multiple government agencies and private organizations and are usually available according to geographic areas demarcated by the US Bureau of the Census, the US Bureau of Labor Statistics, state offices of planning and budget and economics, and counties. Due to the methods used for collecting and reporting socioeconomic data, the study area for socioeconomics is not the same as the planning area; instead, the report describes the socioeconomic setting of the entire three-county study area, an area of just under 28,000 square miles.

Issues of Concern

As noted in the Socioeconomic Baseline Report, certain issues were identified as being of particular concern to regional leaders. One such issue is the predominance of federally managed lands in the region and the resulting impact that federal land use decisions have on possibilities for economic development in the region. Over time, tourism has become an increasingly more important part of the local economy, and federal and state lands play a central role in attracting visitors to the area. There are only limited travel routes through several parts of the region, and many tourists pass through without stopping for long. County officials in the study area have expressed interest in engaging in ongoing efforts to develop destination tourism opportunities as a means of economic development.

Also of high importance to regional leaders is recognition of the important role that livestock ranching plays in the economy. Despite a general loss of money in recent years, ranching enterprises stimulate economic activity in the study area; ranchers hire workers, make payments on bank loans, buy supplies, and engage in other types of commercial activity. This stimulates economic ripple effects throughout the community. Revenues from livestock operations made up more than 80 percent of all agricultural revenues in the study area in 2012, bringing in more

[31] Products associated with EPS and Headwaters Economics are available at no cost to the public and include individual county reports for all counties in the United States, in addition to subject matter reports related to public lands, regional economics, and other topics of interest to government officials, public land managers, and public citizens. See www.headwaterseconomics.org for more information.

than $12 million in revenue for Garfield and Kane Counties alone. Adding Coconino County brings the total up to more than $35 million in revenue. In addition to its direct economic impact, ranching serves as an attraction for visitors who desire to see this economic activity, providing a support service to the tourism industry.

Ranchers depend on healthy range conditions to provide forage for their livestock. To the degree that range health deteriorates, fewer livestock can be supported on the range, endangering the long-term viability of ranching operations. When rangelands are healthy, the probability of financial success in a given year increases for holders of grazing permits{ XE "Permit, Grazing" }.

Brief Overview of Cultural Context related to Ranching

The counties in the study area have a long-standing history of ranching, which has influenced the development of the area's unique culture. The cultural importance of ranching in the area is reflected in county ordinances and state laws, some of which are summarized below. Further information regarding the cultural context in the socioeconomic study area is available in the full Socioeconomic Baseline Report.

In 2013, Garfield County passed a county ordinance establishing the Escalante Historic/Cultural Grazing Region (EHCGR), which recognizes grazing as a historically and culturally significant activity that has contributed to local values for more than a century. In part, the ordinance states that the highest management priority for lands within the EHCGR is responsible management, enhancement, and development of existing and future grazing resources. This is done to protect resources, objects, customs, culture, and values associated with grazing in the American West. The Garfield County ordinance also specifically recognizes multiple use management as being compatible with grazing in the EHCGR and encourages responsible development of mineral and recreation resources there.

In 2014, the Utah State Legislature passed House Bill 158, as amended, which established Utah Grazing Agricultural Commodity Zones and Utah Timber Agricultural Commodity Zones. Among other purposes, House Bill 158 was enacted to preserve and protect the "agricultural livestock industry" and to "maximize efficient and responsible restoration, reclamation, preservation, enhancement, and development of grazing and water resources."

Kane County created Chapter 27: The Escalante Region Multiple Use/Multiple Functions Grazing Zone in its land use ordinance and revised both its general plan and resource management plan. The resource management plan has existing policies for land use management, resource development, and grazing. It also provides information central to the process of coordination and cooperation between Kane County and federal land management agencies.

Kane County Ordinance No. 2014-6 outlines in detail the value of grazing to the local community by specifying the many aspects of county life that are connected with and affected by livestock grazing, both from an economic standpoint and as related to general local culture. In addition, Kane County Ordinance No. 2014-11 recognizes the value of the ranching history of the region for reasons beyond production of cattle. It states "The cowboy lifestyle has helped develop the character of Kane County, and this has been represented in multiple western movies filmed in the area. It is surprising how many people visit the county just to see where the

movies were filmed, and take pictures of livestock and cowboys. The local festival and tradition called Western Legends depends on the cowboy icon and is centered on that historical figure. In essence, ranching and livestock grazing has a direct link to the local tourism industry." Kanab is known as Little Hollywood and is central to the Western Legends theme.

Overview of Social and Economic Conditions

Within the study area, most socioeconomic conditions vary from one county to another. For example, population growth from 1970 to 2012 ranged 61.1 percent in Garfield County to 196.4 percent in Kane County. Growth in all three counties of the study area exceeded that of the United States. However, the basic demographic makeup within the socioeconomic study area typically varies between Garfield and Kane Counties, on one hand, and Coconino County, on the other. The basic population statistics for Coconino County are quite similar to those of the United States as a whole, while Garfield and Kane Counties differ in makeup from the United States as a whole. For example, the populations of Garfield and Kane Counties are markedly older than those of both Coconino County and the United States, while the population of Coconino County is younger than that of the United States Collectively, from 2000 to 2012, the median age for the entire study area increased, although much more so in Garfield and Kane Counties.

The three counties in the study area have collectively experienced steady population growth since 1970; however, Garfield County has seen a slight decline in population growth in recent years. Accordingly, the population of Garfield County has grown more slowly than have the populations of Coconino or Kane Counties. Most of the study area's population growth has been internal (i.e., number of births exceeds death, from 2000 to 2013). Net in-migration did contribute a small percentage to the overall population increase, indicating that more people moved to the study area than moved away from it.

The tables below provide an overview of demographic and economic statistics for the study area. Data for Arizona and Utah and the United States as a whole are provided for comparison (see Table 3-31~~Table 3-31~~, Demography and Population Overview~~Demography and~~ Overview, Table 3-33~~Table 3-33~~, Social and Education Overview, Table 3-34~~Table 3-34~~, Overview, and Table 3-35~~Table 3-35~~, Business Overview). Greater detail for these and other socioeconomic statistics, both in terms of historical data and current trends, is available in the full Socioeconomic Baseline Report.

Table 3-31
Demography and Population Overview

Statistic	USA	Utah	Garfield County	Kane County	Arizona	Coconino County
Population, 2013 estimate	316,128,839	2,900,872	5,083	7,260	6,626,624	136,539
Population, April 1, 2010, estimates base	308,747,716	2,763,885	5,172	7,125	6,392,015	134,437
Population, percent change, April 1, 2010, to July 1, 2013	2.40%	5.00%	-1.70%	1.90%	3.70%	1.60%
Population 2010	308,745,538	2,763,885	5,172	7,125	6,392,017	134,421

Table 3-31
Demography and Population Overview

Statistic	USA	Utah	Garfield County	Kane County	Arizona	Coconino County
Persons under 5 years, percent 2013	6.30%	8.80%	6.10%	6.00%	6.50%	6.20%
Persons under 18 years, percent 2013	23.30%	30.90%	25.60%	23.40%	24.40%	22.30%
Persons 65 years and over, percent 2013	14.10%	9.80%	18.60%	21.50%	15.40%	10.30%
Females, percent 2013	50.80%	49.70%	47.90%	49.70%	50.30%	50.60%
Persons per square mile 2010	87.4	33.6	1	1.8	56.3	7.2

Source: US Census Bureau 2014. Data derived from Population Estimates, American Community Survey, Census of Population and Housing, State and County Housing Unit Estimates, County Business Patterns, Nonemployer Statistics, Economic Census, Survey of Business Owners, Building Permits.

Table 3-32
Race and Ethnicity Overview

Statistic	USA	Utah	Garfield County	Kane County	Arizona	Coconino County
White alone, percent 2013	77.70%	91.60%	94.90%	95.90%	84.00%	66.40%
Black or African American alone, percent 2013	13.20%	1.30%	0.50%	0.40%	4.60%	1.60%
American Indian and Alaska Native alone, percent 2013	1.20%	1.50%	2.30%	1.80%	5.30%	27.40%
Asian alone, percent 2013	5.30%	2.30%	0.80%	0.50%	3.20%	1.70%
Native Hawaiian and Other Pacific Islander alone, percent 2013	0.20%	1.00%	0.20%	0.10%	0.30%	0.20%
Two or More Races, percent 2013	2.40%	2.30%	1.30%	1.40%	2.60%	2.70%
Hispanic or Latino, percent 2013	17.10%	13.40%	5.40%	4.20%	30.30%	13.90%
White alone, not Hispanic or Latino, percent 2013	62.60%	79.70%	90.50%	92.00%	56.70%	55.00%

Source: US Census Bureau 2014. Data derived from Population Estimates, American Community Survey, Census of Population and Housing, State and County Housing Unit Estimates, County Business Patterns, Nonemployer Statistics, Economic Census, Survey of Business Owners, Building Permits.

Table 3-33
Social and Education Overview

Statistic	USA	Utah	Garfield County	Kane County	Arizona	Coconino County
Living in same house 1 year and over, percent 2008-2012	84.80%	82.60%	88.00%	83.90%	80.40%	80.00%
Foreign born persons, percent 2008-2012	12.90%	8.30%	3.30%	2.70%	13.60%	5.30%
Language other than English spoken at home, percentage 5+ 2008-2012	20.50%	14.40%	7.00%	2.70%	26.90%	23.90%
High school graduate or higher, percent of persons age 25+ 2008-2012	85.70%	90.60%	91.10%	94.70%	85.40%	87.10%
Bachelor's degree or higher, percent of persons age 25+ 2008-2012	28.50%	29.90%	21.20%	27.10%	26.60%	30.70%
Veterans, percent 2008-2012	21,853,912	146,524	497	683	530,693	8,452
Mean travel time to work (minutes), workers age 16+ 2008-2012	25.4	21.5	12.2	15.3	24.6	18.4

Source: US Census Bureau 2014. Data derived from Population Estimates, American Community Survey, Census of Population and Housing, State and County Housing Unit Estimates, County Business Patterns, Nonemployer Statistics, Economic Census, Survey of Business Owners, Building Permits.

1

Table 3-34
Housing and Income Overview

Statistic	USA	Utah	Garfield County	Kane County	Arizona	Coconino County
Housing units, 2013	132,802,859	1,006,106	3,768	5,834	2,892,325	64,654
Homeownership rate, 2008-2012	65.50%	70.40%	80.30%	81.50%	65.50%	60.80%
Housing units in multi-unit structures, percent 2008-2012	25.90%	21.30%	5.10%	3.20%	20.60%	18.40%
Median value of owner-occupied housing units 2008-2012	$181,400	$217,800	$160,300	$171,100	$175,900	$237,200
Households, 2008-2012	115,226,802	880,873	1,995	3,210	2,357,158	45,718
Persons per household, 2008-2012	2.61	3.09	2.47	2.18	2.66	2.76

Table 3-34
Housing and Income Overview

Statistic	USA	Utah	Garfield County	Kane County	Arizona	Coconino County
Per capita income in past 12 months (2012 dollars), 2008-2012	$28,051	$23,794	$22,238	$25,885	$25,571	$22,664
Median household income, 2008-2012	$53,046	$58,164	$44,345	$46,979	$50,256	$48,320
Persons below poverty level, percent 2008-2012	14.90%	12.10%	12.30%	7.60%	17.20%	21.80%

Source: US Census Bureau 2014. Data derived from Population Estimates, American Community Survey, Census of Population and Housing, State and County Housing Unit Estimates, County Business Patterns, Nonemployer Statistics, Economic Census, Survey of Business Owners, Building Permits.

Table 3-35
Business Overview

Statistic	USA	Utah	Garfield County	Kane County	Arizona	Coconino County
Private nonfarm establishments, 2012	7,431,808	704,541	141	246	1,313,751	3,499
Private nonfarm employment, 2012	115,938,468	10,709,861	1,182	2,073	21,342,521	44,432
Private nonfarm employment, percent change 2011-2012	2.20%	4.1%[1]	4.40%	-1.40%	1.2%	-0.30%
Nonemployer establishments, 2012	22,735,915	199,393	452	679	413,571	8,413
Total number of firms, 2007	27,092,908	246,393	566	710	491,529	11,407
Black-owned firms, percent 2007	7.10%	0.50%	F	F	2.00%	S
American Indian- and Alaska Native-owned firms, percent 2007	0.90%	0.60%	F	S	1.90%	7.60%
Asian-owned firms, percent 2007	5.70%	1.90%	F	F	3.30%	2.10%
Native Hawaiian and Other Pacific Islander-owned firms, percent 2007	0.10%	0.30%	F	F	S	F
Hispanic-owned firms, percent 2007	8.30%	3.70%	F	S	10.70%	5.60%
Woman-owned firms, percent 2007	28.80%	24.90%	S	15.40%	28.10%	31.10%

Table 3-35
Business Overview

Statistic	USA	Utah	Garfield County	Kane County	Arizona	Coconino County
Manufacturers' shipments, 2007 ($1,000)	5,319,456,312	42,431,657	I	I	57,977,827	1,526,810
Merchant wholesaler sales, 2007 ($1,000)	4,174,286,516	25,417,368	D	3,848	57,573,459	475,616
Retail sales, 2007 ($1,000)	3,917,663,456	36,574,240	22,916	72,071	86,758,801	1,691,664
Retail sales per capita, 2007	$12,990	$13,730	$5,094	$11,098	$13,637	$13,273
Accommodation and food services sales, 2007 ($1,000)	613,795,732	3,980,570	49,289	20,941	13,268,514	717,689
Building permits, 2012	829,658	13,007	33	19	21,726	818

Source: US Census Bureau 2014. Data derived from Population Estimates, American Community Survey, Census of Population and Housing, State and County Housing Unit Estimates, County Business Patterns, Nonemployer Statistics, Economic Census, Survey of Business Owners, Building Permits.

D Suppressed to avoid disclosure of confidential information
F Fewer than 25 firms
I Includes data not distributed by county
S Suppressed; does not meet publication standards

In the study area, economic conditions vary from one county to another (see **Table 3-36**, Employment by Economic Sector~~Employment by Economic Sector~~). For some economic sectors, trends in economic conditions have followed the national trend. An example is in the growth of the service sector as a leading source of employment.[32] Throughout the United States, service sector jobs have become an increasingly important source of household income; household income from manufacturing and extractive industries has generally declined over time at the national level. The study area reflects this national trend, with service sector employment steadily increasing from 1970 up to the present. By contrast, some economic sectors show marked differences to national trends. For example, in 2012, employment in the travel and tourism industry as a percentage of all employment in the study area was more than double that of United States. Travel and tourism, collectively, play a larger role in the economies of the study area than they do in the United States as a whole.

Since 1990, unemployment in Garfield and Kane Counties has roughly followed national trends. Average annual unemployment in the two-county region in 1990 was 7.2 percent. In 2000, it was

[32] The service sector industries includes, among others, utilities; wholesale trade; retail trade; transportation and warehousing; information technology and information services; finance and insurance; real estate, rental, and leasing services; professional and technical services; management of companies and enterprises; administrative and waste services; educational services; health care and social assistance; arts, entertainment, and recreation; accommodation and food services; and all other services except for public administration.

Table 3-36
Employment by Economic Sector

Employment by Industry, Percent of Total (2012)	Garfield County, Utah	Kane County, Utah	Coconino County, Arizona	Kane-Garfield Two-County Region	United States
Agriculture, forestry, fishing and hunting, mining	8.9%	3.0%	1.8%	5.4%	1.9%
Construction	5.0%	6.9%	6.9%	6.1%	6.5%
Manufacturing	2.4%	3.1%	6.3%	2.8%	10.6%
Wholesale trade	0.6%	1.1%	1.6%	0.9%	2.8%
Retail trade	8.6%	10.5%	12.5%	9.7%	11.6%
Transportation, warehousing, and utilities	6.2%	6.3%	5.5%	6.2%	5.0%
Information	6.6%	1.7%	1.0%	3.7%	2.2%
Finance and insurance, and real estate	3.0%	5.9%	3.9%	4.7%	6.7%
Professional, scientific, management, administrative, and waste management.	5.3%	6.3%	6.7%	5.9%	10.7%
Education, health care, and social assistance	19.9%	20.7%	26.7%	20.4%	22.9%
Arts, entertainment, recreation, accommodation, and food	28.8%	18.7%	16.9%	22.9%	9.2%
Other services, except public administration	1.4%	9.4%	3.8%	6.2%	4.9%
Public administration	3.4%	6.2%	6.4%	5.1%	4.9%

Source: Headwaters Economics 2015

5.2 percent, but then nearly doubled to 10 percent by 2010, which was close to the peak of the nationwide recession. After that point, the unemployment rate steadily declined, falling to 9.5 percent in 2011, 8.4 percent in 2012, and 7.4 percent in 2013 in the two counties combined.[33] According to the Utah Department of Workforce Services, in November 2016 the unemployment rates in Garfield and Kane Counties were 6.8 percent and 3.2 percent, respectively.[34]

In 2012, the most important industries in terms of total employment in the study area were arts, entertainment, recreation, accommodation, and food; education, health care, and social assistance; and retail trade. Agriculture, forestry, fishing and hunting, and mining provided nearly 9 percent of all employment in Garfield County, 3 percent in Kane County, and 1.8 percent in Coconino County. For the manufacturing sector, its relative importance was the inverse for these counties, as compared to that of agriculture, forestry, fishing and hunting, and mining as a category; manufacturing accounted for 6.3 percent of employment in Coconino County at the highest end and 2.4 percent of employment in Garfield County at the lowest end. In 2015, Alton

[33] Source: Headwaters Economics 2017
[34] https://jobs.utah.gov/wi/pubs/une/season.html, accessed January 2017

Coal's Coal Hollow Project, located just southeast of Alton, Utah, employed 54 miners and 46 truck drivers. Mine managers project that the mine will employ between 150 and 200 workers over the next 40 years (Kane County 2015).

During 2012, both family and corporate farms in the study area experienced income losses, rather than earning positive net income. As some farmers and ranchers have reported, it is often only off-farm or off-ranch employment that allows farmers and ranchers to continue operating through economically bad years. In some years, federal agricultural subsidies and disaster payments, as well as payments for implementing conservation practices, offset some of the losses incurred by farmers and ranchers in the study area. **Table 3-37**, Farm Earnings, displays the economic outcomes from farm earnings in the planning-area counties and the United States.

Table 3-37
Farm Earnings

Farm Earnings in $1,000s of 2013 Dollars (based on 2012 data)	Garfield County, Utah	Kane County, Utah	Coconino County, Arizona	Kane-Garfield Two-County Region	United States
Farm earnings	-$4,080	-$226	$95	-$4,307	$101,282,790
Farm proprietors' income	-$5,911	-$695	-$1,382	-$6,607	$77,787,570
Non-farm earnings	$96,116	$140,260	$3,366,140	$236,376	$9,867,442,270
Total cash receipts and other income	$10,353	$11,302	$32,988	$21,655	$471,139,975
Cash receipts from marketing:	$7,554	$10,427	$27,579	$17,981	$426,846,820
Livestock and products	$5,639	$9,969	$26,134	$15,609	$201,616,489
Crops	$1,914	$458	$1,444	$2,372	$225,230,331
Other income	$2,799	$875	$5,409	$3,674	$44,293,155
Government payments	$81	$0	$481	$81	$10,794,642
Imputed rent and miscellaneous income	$2,718	$875	$4,928	$3,593	$33,498,513
Total production expenses	$16,120	$13,288	$36,936	$29,409	$365,622,450
Realized net income (receipts - expenses)	-$5,767	-$1,986	-$3,948	-$7,754	$105,517,524
Value of inventory change	-$1,008	-$397	-$1,010	-$1,405	-$7,611,051
Total net income, including corporate farms	-$6,775	-$2,383	-$4,958	-$9,158	$97,906,474

Source: Headwaters Economics 2015

Additionally, farmers and ranchers sometimes draw from equity in farm properties and productive capital in order to bridge from one good year to another, with one or more "down" years in between (EWG 2015). In contrast with the study area, farming and ranching in the United States as a whole had positive economic returns in 2012. In the study area, revenue from the sales of livestock and livestock-related products comprised more than 54 percent of total cash receipts and other farm or ranch income. And although ranches lose money during less-successful years, ranches and ranching families also spend a non-trivial amount of money in their

communities and provide employment opportunities in the region. This local spending generates ripple effects of economic activity in the region through additional, indirect spending on goods and services.

In 2014, agricultural economist Dr. Gill Miller and Kevin Heaton of Utah State University's Cooperative Extension analyzed the ranching economy in Garfield and Kane Counties (Miller and Heaton 2015). The following is their conclusions:

> Replacing livestock grazing on GSENM with [tourism] revenues would require substantial investment by GSENM, local governments, and the private sector. The type of tourism would need to be changed to include destination tourism to use the resources and values{ XE "Resources and Values (Glen Canyon)" } of GSENM to sustain the economy of the Garfield-Kane County's region.
>
> Tourist visitations in the Garfield-Kane County's economic region are dependent upon fuel cost, income levels, and exchange rate. Therefore, tourist visitations are variable. Limiting or removing livestock grazing and replacing with tourism changes the culture, heritage and values of the region.
>
> The economic sustainability of the Garfield-Kane County's economic region is greatly weakened if GSENM livestock grazing allotments are lost by removing an industry, its supporting industries, and reducing the economic diversity of the region.
>
> Ranching families provide year-round stability to communities that have a relatively high population turnover rate.
>
> Ranching has fewer impacts on public safety, emergency, and other public infrastructure resources than tourism.

In response to these concerns, the report suggests that "…Garfield-Kane County's economic region, local governments, and citizens should vigorously oppose any livestock grazing plan that reduces or eliminates livestock grazing in GSENM."

Goods and services can be divided into two broad categories: market and nonmarket. Market goods and services are those for which a market exists or can exist, meaning that it is possible to buy and sell those goods and services. On the other hand, nonmarket goods and services are those that are not available for purchase and that cannot be sold, whether for physical or legal reasons. Public lands provide both market and nonmarket goods and services that are beneficial to communities, economies, groups, and individuals (Maczko and Hidinger 2008). An example of a nonmarket goods provided by public lands is the water filtering service provided by an intact wetland{ XE "Wetland" } (Turner et al. 1993).

GSENM provides a broad range of nonmarket goods and services to communities in the study area and to visitors from outside of the study area (Burr et al. 1997). Examples include the following:

- The experience of solitude and the opportunity to view uniquely sublime landscapes and scenery and the spiritual and psychological benefits that can come from those experiences
- Opportunities for completing basic research on GSENM, including research in physical and social sciences
- Educational opportunities for students, for those who visit the planning area and those who participate in regional in-class programs and in the web-based, global curriculum, www.gsenmschool.org, which is used by teachers and students around the world
- Habitat for non-game wildlife species

3.19.2 Trends

Socioeconomic trends in the study area were described in the preceding section where discernable trends were present. As noted, trends in individual counties may differ from those of the study area.

Trends common to the study area are as follows:

- Increasing median age, 2000 to 2012
- Steady population growth since 1970 (this trend varies in recent years by county)
- Growth in the importance of service sector employment

3.19.3 References

BLM (United States Department of the Interior, Bureau of Land Management). 2015. Socioeconomic Baseline Report for the Grand Staircase-Escalante National Monument Livestock Grazing Plan Amendment EIS. Kanab, Utah.

Burr, S. W., D. J. Blanha, and D. K. Reiter. 1997. *Grand Staircase-Escalante National Monument Front Country Visitors' Characteristics, Monument Management and Community Services Impressions, and Expenditures in the Monument Area*. In: Learning from the Land: Grand Staircase-Escalante National Monument Science Symposium proceedings: November 4-5, 1997, Southern Utah University.

Kane County. 2015. Comment letter on draft Socioeconomic Baseline Report from Kane County to the United States Department of the Interior, Bureau of Land Management, Grand Staircase-Escalante National Monument, Kanab, Utah. Letter dated July 20, 2015.

Environmental Working Group (EWG). 2015. Farm Subsidy Database. Internet web site: http://farm.ewg.org/index.php. Accessed in July 2016.

Headwaters Economics. 2015. Economic Profile System. Internet web site: http://headwaterseconomics.org/tools/economic-profile-system/about/. Accessed in July 2016.

Maczko, K. and L. Hidinger (editors). 2008. SRR Monograph No. 3: Sustainable Rangelands Ecosystem Goods and Services. Sustainable Rangelands Roundtable, Fort Collins, Colorado.

Miller, G., and K. Heaton. 2015. "Economic and Cultural Report on Livestock Grazing in The Grand Staircase Escalante National Monument to The Kane County Board of Commissioners." Kane County, Kanab, Utah.

Turner, K., D. Pearce, and I. Bateman. 1993. *Environmental Economics: An Elementary Introduction*. Johns Hopkins University Press, Baltimore, Maryland.

United States Census Bureau. 2014. State and county QuickFacts. Internet web site: https://www.census.gov/quickfacts/table/PST045215/00. Accessed in July 2016.

3.20 ENVIRONMENTAL JUSTICE

Environmental justice refers to the fair treatment and meaningful involvement of people of all races, cultures, and incomes with respect to the development, implementation, and enforcement of environmental laws, regulations, programs, and policies. It focuses on environmental hazards and human health to avoid disproportionately high and adverse human health or environmental effects on minority and low-income populations. Executive Order 12898, Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations, requires federal agencies to identify and address any disproportionately high and adverse human health or environmental effects of their programs, policies, and activities on minority and low-income populations.

According to the CEQ{ XE "Council on Environmental Quality (CEQ)" }'s Environmental Justice Guidelines for NEPA{ XE "National Environmental Policy Act (NEPA)" } (1997), "In order to determine whether a proposed action is likely to have disproportionately high and adverse human health or environmental effects on low-income populations, minority populations, or Indian tribes, agencies should identify a geographic scale, obtain demographic information on the potential impact area, and determine if there is a disproportionately high and adverse effect on these populations. Agencies may use demographic data available from the Bureau of the Census to identify the composition of the potentially affected population. Geographic distribution by race, ethnicity, and income, as well as a delineation of tribal lands and resources, should be examined."

It further states that "minority populations should be identified where either the minority population of the affected area exceeds 50 percent or where the minority population percentage of the affected area is meaningfully greater than the minority population percentage in the general population or other appropriate unit of geographic analysis." For this analysis, "meaningfully greater' is classified as ten percentage points or more higher than that of the state level reference population.

Minorities are defined as individuals who identify as of one or more of the following population groups:

- American Indian or Alaskan Native

- Asian or Pacific Islander
- Black, not of Hispanic origin
- Hispanic of any race

Further, CEQ{ XE "Council on Environmental Quality (CEQ)" } states that in identifying minority communities, agencies may consider as a community either of the following:

- A group of individuals living in geographic proximity to one another
- A geographically dispersed/transient set of individuals, where either type of group experiences common conditions of environmental exposure or effect

A minority population also exists if there is more than one minority group present and the minority percentage, as calculated by aggregating all minority persons, meets one of the above-stated thresholds.

Low-income populations are defined as persons living below the poverty level, based on total income of $11,888 for an individual and $23,624 for a family of four for 2013 data (United States Census Bureau 2013). The BLM, CEQ{ XE "Council on Environmental Quality (CEQ)" }, and EPA guidance do not provide a quantitative threshold (e.g., a limit on the percent of persons in poverty) for determining whether a population should be considered a low income population. For this analysis, the percent of persons in poverty in the study area is compared to that of the state.

The MMP{ XE "Monument Management Plan, Grand Staircase-Escalante National Monument (MMP 2000)" }-A planning area includes Kane and Garfield Counties in Utah and a small portion of Coconino County in Arizona. For environmental justice analysis, populations in all three counties have been examined using United States Census data to determine the percentage of low-income and minority populations. In addition, the census tracts within the counties are examined in further detail.

Data on effects by each alternative, reported in **Chapter 4**, were examined to ascertain whether there are disproportionate effects of the alternatives on low-income or minority populations.

3.20.1 Current Conditions

Low-Income Populations

For Utah, both Kane County (7.8 percent) and Garfield County (11.5 percent) had poverty rates below that of the state average, which is 12.7 percent (**Table 3-38**, Poverty in Study Area Populations). Similar trends were seen for families in poverty. Poverty data for individuals was also examined by census tracts in Kane and Garfield Counties. Tract 1301 in Kane County was slightly above that of the state average at 14.1 percent of individuals in poverty. Tract 1302 was below the state and county average with 4.8 percent of the population in poverty. In Garfield County, census tracts were similar or below that of the county average (11.5 percent) at 9.7 percent in Census Tract 3 and 11.6 percent in Census Tract 4.

Table 3-38
Poverty in Study Area Populations

Geographic Area*	Total Population	Percent Below the Poverty Line	
		Individuals	Families
Garfield County, Utah	5,123	11.5	9.2
Census Tract 3	2,546	9.7	8.6
Census Tract 4*	2,577	11.6	11.3
Kane County, Utah	7,176	7.8	4.0
Census Tract 1301*	2,306	14.1	7.0
Census Tract 1302*	4,870	4.8	2.4
Coconino County, Arizona	134,795	23.0	15.5
Census Tract 1	3,753	7.9	5.9
Census Tract 2	3,912	18.8	10.6
Census Tract 3	6,465	40.5	31.5
Census Tract 4	5,520	13.4	11.0
Census Tract 5	5,004	23.6	17.7
Census Tract 6	5,695	8.2	5.4
Census Tract 7	3,416	14.4	6.3
Census Tract 8	4,533	44.7	19.3
Census Tract 9	6,688	18.4	10.0
Census Tract 10	8,602	78.4	76.9
Census Tract 11.01	4,901	15.0	10.1
Census Tract 11.02	6,704	36.8	19.7
Census Tract 12	2,532	24.0	9.9
Census Tract 13.01	6,231	9.1	18.8
Census Tract 13.02	5,632	4.7	2.3
Census Tract 15	2,943	16.0	13.5
Census Tract 16	3,036	9.2	6.7
Census Tract 17	3,521	21.3	16.4
Census Tract 20*	1,889	18.5	9.9
Census Tract 21	7,224	18.0	13.3
Census Tract 22	6,358	14.9	9.6
Census Tract 23	5,074	25.0	17.3
Census Tract 9422.01	3,958	27.8	26.4
Census Tract 9422.02*	3,900	38.7	36.8
Census Tract 9449	4,853	35.8	30.3
Census Tract 9450	4,040	36.7	34.5
Census Tract 9451	3,436	35.2	31.7
Census Tract 9452	4,965	25.1	20.0
Utah	2,813,673	12.7	9.3
Arizona	6,479,703	17.9	13.0
United States	311,536,594	15.4	11.3

Source: United States Census Bureau 2013b

*Census tract completely or partially within the planning area

In Arizona, Coconino County, at 23 percent of the population in poverty, had a larger percent of the population in poverty than the state average (17.9 percent). Poverty data for individuals was also examined by census tracts in Coconino County; there is a great degree of variation in level of population in poverty, including in tracts in or next to the planning area. In Tract 9422.02, the percentage of people living in poverty was 38.7 percent, and well above that of the State (17.9 percent) and County (23.0 percent) levels. Tract 20 had approximately 18.5 percent of the population in poverty, below that of the county level and slightly higher than that of the state level.

Minority Populations

In Utah, based on 2009-2013 data, approximately 80.1 percent of the population was identified as White and not of Hispanic or Latino origin. The remaining 19.9 percent identified as ethnic or racial minorities or both and are classified in **Table 3-39**, Study Area Populations by Race/Ethnicity, as the aggregate minority population. People of Hispanic or Latino descent (of any race) were the largest minority group and accounted for 13.1 percent of the total state population (United States Census Bureau 2013b). Both Garfield and Kane Counties were less diverse than that of the state, with aggregate minority populations of 8.9 and 7.4 percent, respectively.

Table 3-39
Study Area Populations by Race/Ethnicity

Geographic Unit	Total Population	Percent of Total Population								
		White	Black or African American	American Indian or Alaskan Native	Asian	Native Hawaiian and Pacific Islander	Other Race	Two or more Races	Hispanic or Latino	Aggregate minority population
Garfield County, Utah	5,123	91.1	0.6	2.2	0.2	0.3	0.1	0.4	5.0	8.9
Census Tract 3	2,546	93.0	0.2	0.3	1.1	0.6	0.0	0.1	4.6	7.0
Census Tract 4 *	2,577	89.1	1.1	3.8	0.3	0.0	0.0	0.2	5.4	10.9
Kane County, Utah	7,176	92.6	0.4	0.8	0.2	0.1	1.6	0.0	4.0	7.4
Census Tract 1301*	2,306	88.6	0.6	2.4	0.7	1.1	0.3	2.6	3.7	11.4
Census Tract 1302*	4,870	94.5	0.3	0.1	0.0	0.0	0.0	1.1	4.1	5.5
Coconino County, Arizona	134,795	55.0	1.2	26.2	1.4	0.1	0.1	2.3	13.7	45.0
Census Tract 1	3,753	77.5	.01	5.6	1.1	0.0	0.0	4.8	10.9	22.5
Census Tract 2	3,912	71.7	.09	9.0	1.8	0.3	0.0	3.1	13.2	28.3
Census Tract 3	6,465	35.7	2.8	19.3	1.1	0.0	0.0	0.3	40.8	64.3
Census Tract 4	5,520	61.7	2.0	11.4	1.6	0.0	0.4	1.9	21.0	38.3
Census Tract 5	5,004	44.5	0.8	22.0	0.9	0.0	0.1	3.2	28.6	55.5
Census Tract 6	5,695	78.8	2.3	10.5	1.7	0.0	0.0	0.3	6.5	21.2
Census Tract 7	3,416	74.3	0.1	12.2	1.1	0.0	0.0	1.3	11.0	25.7

Table 3-39
Study Area Populations by Race/Ethnicity

Geographic Unit	Total Population	Percent of Total Population								
		White	Black or African American	American Indian or Alaskan Native	Asian	Native Hawaiian and Pacific Islander	Other Race	Two or more Races	Hispanic or Latino	Aggregate minority population
Census Tract 8	4,533	60.8	3.0	15.5	0.5	1.4	0.0	4.1	14.8	39.2
Census Tract 9	6,688	70.0	0.9	9.8	1.3	0.0	0.0	3.1	14.9	30.0
Census Tract 10	8,602	64.1	3.8	6.4	3.8	0.0	0.2	6.6	15.1	35.9
Census Tract 11.01	4,901	69.0	2.1	12.6	1.8	0.4	0.0	2.8	11.3	31.0
Census Tract 11.02	6,704	55.0	0.1	5.0	7.7	0.0	0.0	2.8	29.4	45.0
Census Tract 12	2,532	73.2	2.3	3.6	1.1	0.0	0.0	2.4	17.4	26.8
Census Tract 13.01	6,231	71.6	1.0	15.9	0.0	0.0	0.0	1.1	10.1	28.4
Census Tract 13.02	5,632	75.9	4.1	2.0	0.3	0.2	0.0	0.0	17.5	24.1
Census Tract 15	2,943	89.5	0.0	3.5	0.0	0.0	0.0	3.3	3.7	10.5
Census Tract 16	3,036	92.1	0.0	0.0	2.0	0.0	0.0	2.9	3.0	7.9
Census Tract 17	3,521	64.5	1.1	2.2	0.7	0.0	0.3	1.9	29.4	35.5
Census Tract 20*	1,889	80.0	0.0	12.2	1.4	0.2	0.0	3.9	2.3	20.0
Census Tract 21	7,224	64.1	0.0	23.3	0.0	0.0	0.0	3.3	9.3	35.9
Census Tract 22	6,358	75.0	0.1	6.4	0.0	0.0	0.0	4.2	14.2	25.0
Census Tract 23	5,074	71.6	1.1	10.7	0.7	0.0	0.5	2.8	12.7	29.4
Census Tract 9422.01	3,958	1.0	0.1	97.0	0.0	0.0	0.0	0.4	1.4	99.0
Census Tract 9422.02*	3,900	1.0	0.9	96.7	0.0	0.2	0.4	0.1	0.7	99.0
Census Tract 9449	4,853	4.0	0.0	90.4	2.9	0.0	0.0	0.5	2.2	96.0
Census Tract 9450	4,040	1.7	0.0	93.7	1.2	0.0	0.0	0.3	3.0	98.3
Census Tract 9451	3,436	0.7	0.1	94.9	0.2	0.0	0.0	1.7	2.5	99.3
Census Tract 9452	4,965	4.2	0.0	92.7	0.5	0.0	1.4	0.1	1.1	95.8
Utah	2,813,673	80.1	1.0	1.0	2.0	0.9	0.1	1.7	13.1	19.9
Arizona	6,479,703	57.3	3.9	4.0	2.8	0.2	0.1	1.8	29.9	42.7
United States	311,536,594	63.3	12.2	0.7	4.8	0.2	4.7	2.8	16.6	36.7

Source: United States Census Bureau 2013

*Census tract is completely or partially in the planning area.
Note: American Community Survey estimates are based on data collected over five years. The estimates represent data collected between 2009 and 2013 and do not represent a single point in time. Aggregate minority population includes any individuals who identified themselves as belonging to one or more ethnic or racial minority. This population is calculated by total population minus those of White non-Hispanic origin.

Minority status was also examined for census tracts in Garfield and Kane Counties. All those census tracts had aggregate minority populations below that of the state (19.9 percent) and within 5 percentage points of the respective county average.

In Arizona, based on 2009-2013 data, approximately 57.3 percent of the population was identified as White and not of Hispanic or Latino origin. The remaining 42.7 percent identified as ethnic or racial minorities or both. People of Hispanic or Latino descent (of any race) were the largest minority group and accounted for 29.9 percent of the total state population (United States Census Bureau 2013a). Coconino County is more diverse than the state. In Coconino County, approximately 55 percent of the population identified as White of non-Hispanic/Latino origin, and the remaining 45 percent identified as ethnic or racial minority or both. The largest minority group was Native Americans at 26.2 percent of the county population, which is notably higher than that of the state population (4.4 percent) or the United States population (0.7 percent). The county includes portions of the Navajo Indian reservation.

Minority status was also examined for all census tracts in Coconino County, with a focus on census tracts in or next to the planning area. There is a large variation in the level of racial and ethnic minorities in the county. Notably, of the two tracts within and next to the planning area, Census Tract 9422.02 had a Native American population of 99 percent, while Census Tract 20 had minority levels below that of the Arizona state level, with an aggregate minority population of 20 percent.

Tribal Populations

Kane and Garfield Counties were historically home to the Paiute, Navajo, and Hopi tribes. Coconino County is home to the Havasupai Nation, and parts of the Navajo Nation, Hualapai Nation, Hopi Nation, and Kaibab Band of Paiute Indians. The county has 7,142.42 square miles of federally designated Indian reservation, including portions of the Navajo Hualapai, Hopi, and Kaibab Paiute Indian Reservation and all of the Havasupai Indian Reservation.

Note that impacts on tribal populations may not be limited to geographic extent of reservations or current tribal populations; project activities that could impact traditional cultural uses could also be considered to result in impacts on this population. In addition, differential impacts could occur due to a community's distinct cultural practices. For example, differential patterns of living, such as subsistence vegetation or wildlife consumption, including traditional native plant collection, could result in differential impacts from the general population. Based on government-to-government consultation to date, there is concern for traditional tribal or cultural resources associated with the Hopi and Kaibab Paiute tribes as a result of project activities. Additional information is included in **Section 3.18~~5~~**, Tribal Interests.

3.20.2 References

CEQ{ XE "Council on Environmental Quality (CEQ)" } (Council on Environmental Quality). 1997. Environmental Justice Guidance under the National Environmental Policy Act{ XE "National Environmental Policy Act (NEPA)" }. December 10, 1997.

United States Census Bureau. 2013a. Poverty threshold by size of family. Internet website: www.census.gov/hhes/www/poverty/data/threshld/index.html.

______. 2013b. Five-year American Community Survey Data (2009-2013). Internet website: http://factfinder.census.gov/faces/nav/jsf/pages/index.xhtml.

This page intentionally left blank.

BLM – GRAND STAIRCASE-ESCALANTE NATIONAL MONUMENT
LIVESTOCK GRAZING MMP-A/EIS

BLM Washington Office Comments on Administrative Draft MMP-A/EIS (January 2017)

Cmt #	Page #	Line #/Table #/ Figure #	WO Commenter	Comment	A/R/M[1]	Response
1.	Various	Use Search to find locations and correct.	Mayberry	Please do not refer to grazing preference in terms of AUMs. Under current regulation, preference establishes priority for obtaining a permit, it does not establish the amount of grazing use See definition in 4100.0-5. Permitted Use, Active Use and Suspended Use identify the AUMs that are authorized for grazing.	A	Global change made
2.		General Proclamation	Brian Novosak	Recommend providing the full text of the proclamation as an appendix	A	Proclamation added at beginning of EIS document.
3.		general	Deb Salt	I did a quick review of the document for involvement Old Spanish NHT. In the history section, the "Spanish Trail" is mentioned, and notes that the trail may be located at the southern border of GSENM. Comment: Beyond the history section, the Old Spanish National Historic Trail (NHT) appears to receive no specific treatment in the document. If the Old Spanish NHT is located within the boundary of the analysis area, the trail must be addressed in accordance with BLM manual 6280. Otherwise, a negative declaration should be made within the document to confirm for the reader that it is outside the analysis area.	M	Added the following text to the beginning of Chapter 3: A portion of the designated corridor of the Old Spanish National Historic Trail is within the planning area and primarily follows Highway 89. The route in the vicinity of the designated corridor was used for one round-trip before it was abandoned for a northerly route. Because it was only used one time, no trail remnants or assicated sites are present. The primary concern for the designated corridor is visual impacts. There would be no visual impacts from livestock grazing that would affect the experience of travelers along the designated corridor seeking to experience the Old Spanish National Historic Trail. Therefore, this topic is not discussed further in this document.
4.		General	C. Bailey	Nice job on the Wild and Scenic Rivers sections in chapters 3 and 4.	n/a	Thank you.
5.		General	Wick	Overall: I did a quick overview of the document before digging into specifics. Since 40% of the	A	Added the following text to Chapter 3: Pre-FLPMA livestock developments (range improvements) may continue to be used and

[1]For EMPSi use:
A = comment accepted; document changed as recommended
R = comment rejected w/ explanation
M = document changed due to comment but in a different manner than suggested

BLM Washington Office Comments on Administrative Draft MMP-A/EIS (January 2017)

Cmt #	Page #	Line #/Table #/ Figure #	WO Commenter	Comment	A/R/M[1]	Response
				monument is designated as WSAs, discussion of the WSA non-impairment requirement and the 6330 manual seems like it should be given comparable treatment to the monument proclamation as it can place more sideboards on management & especially consideration of an alternative that expands grazing or range improvements within the WSA portion of the NM so that they don't comply with these policies. The monument proclamation and the Glen Canyon proposed wilderness requirements/sideboards are explicitly described within the alternatives and chapters 3 and 4 as are requirements of a number of grazing/vegetation related manuals. By simply referencing the 6330 (and 40) manuals I believe it will give a false impression to readers we have broader discretion/sideboards than we actually do within the WSA/wilderness parts of the planning area.		maintained in the same manner and to the same degree as such use was being conducted on October 21, 1976. New range improvements may only be approved if they meet the nonimpairment standard or one of the exceptions to the nonimpairment standard. The nonimpairment standard states that the use or facility must be temporary and cannot create new surface disturbance. If new range improvements meet the standard, they can be allowed. Grazing use can also be increased in WSAs beyond what was permitted on October 21, 1976, provided that such use meets the nonimpairment standard or one of the exceptions. Grazing in WSAs is also subject to BLM policies. Grazing can be reduced in WSAs if, for example, the rangeland is failing to achieve standards for rangeland health and grazing management practices are determined to be the significant causal factor (BLM 2012). The nonimpairment standard is described in detail in BLM Manual 6330, Section 1.6.C (page 1-10; BLM 2012). Policies for grazing management in WSAs are described in BLM Manual 6330, Section 1.6.D.3 (page 1-16; BLM 2012).
6.		General	Wick	Please separate wilderness and wilderness study area discussions throughout the document/analysis. They are managed under differing laws and policies and we do not want to give the incorrect impression that the BLM is managing WSAs as de-facto wilderness. WSAs are managed under section 603 (and 202) of FLPMA so as not to impair	A	Separated out in Chapters 3, 4, and the summary of impacts tables. Added reference to appropriate management tools.

[1]For EMPSi use:
A = comment accepted; document changed as recommended
R = comment rejected w/ explanation
M = document changed due to comment but in a different manner than suggested

BLM Washington Office Comments on Administrative Draft MMP-A/EIS (January 2017)

Cmt #	Page #	Line #/Table #/ Figure #	WO Commenter	Comment	A/R/M[1]	Response
				their suitability for Congressional Wilderness Designation; Wilderness is managed under the Wilderness Act of 1964 and specific legislation designating the area to protect wilderness character - -as well as the wilderness management plan for the area and the Congressional Grazing Guidelines (see: http://www.wilderness.net/grazing#) There are differing sideboards for allowable uses such as vehicle use & different yardsticks for measuring impacts yes there is some overlap in how we manage & identify impacts between the two, but there are substantial differences that need to be discussed as well.		
7.		General	Kristy Swartz, Fire & Aviation	Wildland Fire Management was not analyzed adequately. In reviewing the scoping report, fire management, alteration of fire regimes, and the effects of grazing on wildfire occurrence and spread were identified by the public (many of these comments are not summarized under Fire Management and are sprinkled through the other summaries including Biological/Ecological Resources, Climate Change, Economics, Grazing, Vegetation (General), General Comments, and Grazing Implementation). Recommend including analyses that address relevant issues identified by	A	Included a section on Wildland Fire Management in Chapters 3 and 4.

[1]For EMPSi use:
A = comment accepted; document changed as recommended
R = comment rejected w/ explanation
M = document changed due to comment but in a different manner than suggested

EMPS

BLM Washington Office Comments on Administrative Draft MMP-A/EIS (January 2017)

Cmt #	Page #	Line #/Table #/ Figure #	WO Commenter	Comment	A/R/M[1]	Response
				the public during scoping. I recommend the EIS address how the range of grazing alternatives would affect: ✓ Ability to protect values at risk from fire ✓ Fire Return Interval, ✓ Fire Occurrence ✓ Fire Spread ✓ Fuel Loading (Wildfire Potential/Wildfire Hazard) ✓ Ability to manage fires		
8.		General	Tim Fisher WO410 NM/NCA	No Purpose or Need identified in the plan using grazing as a resource management tool such as to deter noxious weed / fire /etc. Will the plan and grazing be used as a Resource Management tool? If so should be identified.	R	Using livestock grazing as a management tool is not a livestock grazing program issue; it is a vegetation or fire management issue and thus is outside the scope of this MMP-A.
9.		General	Sally Butts WO410	The overview RMP questions identified in the draft coordination IM that are normally expected to be addressed in RMP review have been streamlined for the GSENM DRMP-A/DEIS and follow: <u>General</u> 1. Are all National Conservation Lands units that are located within the planning area identified and impacts on those lands addressed in the RMP-A alternatives? 2. Are management actions identified in the RMP that limit or exclude land use activities that are incompatible with the		1. Yes, NCL units are identified and impacts are addressed in Chapter 4. Because this is specifically a livestock grazing amendment, direction for NCL units is not included in the alternatives. 2. Because this is specifically a livestock grazing amendment, direction for NCL units is not included in the alternatives. Consideration was given to these areas in developing the alternatives and impacts are described in Chapter 4. 3. Yes 4. Yes 5. No. All grazing activities in WSAs would be consistent with BLM manual 6330. 6. No. All grazing activities in WSAs would be consistent with BLM manual 6330. 7. Yes

[1]For EMPSi use:
A = comment accepted; document changed as recommended
R = comment rejected w/ explanation
M = document changed due to comment but in a different manner than suggested

EMPS inc.

BLM Washington Office Comments on Administrative Draft MMP-A/EIS (January 2017)

Cmt #	Page #	Line #/Table #/ Figure #	WO Commenter	Comment	A/R/M[1]	Response
				management of National Conservation Land units and other related special areas? <u>National Monuments</u> 3. Do alternatives consider impacts to the resources, objects, and values for which the GSENM was designated? If not, provide an explanation about how future project-level actions and analyses would consider impacts. 4. Are all land use planning decisions in the RMP consistent with the purposes and objectives of the designating proclamation that established the GSENM? <u>Wilderness Study Area</u> 5. Do alternatives establish new discretionary uses in WSAs that would impair the suitability for wilderness designation? 6. Do the alternatives introduce changes in manner and degree to grandfathered livestock grazing uses within WSAs? 7. Do the alternatives otherwise meet the non-impairment standard described in Manual 6330 -- Management of BLM Wilderness Study Areas?" <u>Willderness</u> 8. If motorized use is necessary in order to maintain livestock management structures and installations in the wilderness, are		8. Yes 9. The inventory is from the past Utah state-wide effort. This has been discussed with Bob Wick. 10. No 11. The alternatives do not consider impacts because the impact analysis in Chapter 4 does that. In addition, language in Section 2.2.1 states: Prior to authorizing surface-disturbing activities, including nonstructural range improvements, the BLM will ensure that wilderness characteristics inventories are current and potential effects on lands with wilderness characteristics have been analyzed in subsequent site-specific NEPA documents. These future site-specific NEPA documents will include a range of alternatives, including at least one that minimizes impacts on or does not impact lands with wilderness characteristics. The analysis in will include reasonably foreseeable cumulative effects from implementing this plan. 12. Yes, eligibility and suitability studies were completed for the MMP/EIS. 13. Yes, impacts on suitable segments are disclosed in Chapter 4. 14. N/A 15. N/A

[1]For EMPSi use:
A = comment accepted; document changed as recommended
R = comment rejected w/ explanation
M = document changed due to comment but in a different manner than suggested

EMPS inc.

BLM – GRAND STAIRCASE-ESCALANTE NATIONAL MONUMENT
LIVESTOCK GRAZING MMP-A/EIS

BLM Washington Office Comments on Administrative Draft MMP-A/EIS (January 2017)

Cmt #	Page #	Line #/Table #/ Figure #	WO Commenter	Comment	A/R/M[1]	Response
				the alternatives drafted to determine the method that least impacts wilderness character while remaining consistent with the rule of practical necessity and reasonableness in supporting the livestock grazing program? <u>Lands with wilderness characteristics</u> 9. Does the FO have a complete, updated inventory of lands with wilderness characteristics? Yes, No, or Partial? 10. Have external organizations provided inventory information and has that information been acknowledged in the RMP? 11. Do alternatives consider impacts to wilderness characteristics? If not, provide an explanation about how future project-level actions and analyses would consider impacts. <u>Eligible and Suitable WSR</u> 12. Have WSR eligibility and suitability evaluations been conducted and are they current? Yes or No? 13. Are impacts to eligible and suitable WSR segments considered in the RMP-A? If not, provide an explanation about how future project-level actions and analyses would consider impacts. <u>National Scenic and Historic Trails</u>		

[1]For EMPSi use:
A = comment accepted; document changed as recommended
R = comment rejected w/ explanation
M = document changed due to comment but in a different manner than suggested

BLM Washington Office Comments on Administrative Draft MMP-A/EIS (January 2017)

Cmt #	Page #	Line #/Table #/ Figure #	WO Commenter	Comment	A/R/M[1]	Response
				14. Has an inventory of National Trail resources, qualities, values, and associated settings and the primary use or uses been conducted? Yes or No? 15. Are impacts to the National Trail resources, qualities, values, and associated settings and the primary use or uses considered? If not, provide an explanation about how future project-level actions and analyses would consider impacts.		
10.	ES-5	ES.2 Purpose of and the Need for the MMPA.	Tim Fisher WO410 NM/NCA	The GSENM Grazing Plan "Purpose" should integrate the 6220 Manual where its focuses on grazing to include: 1. Where consistent with the designating legislation or proclamation, livestock grazing may occur within Monuments and NCAs. 2. Grazing management practices will be implemented in a manner that protects Monument and NCA objects and values unless otherwise provided for in law. 3. The BLM will use Monuments and NCAs as a laboratory for innovative grazing techniques designed to better conserve, protect, and restore NLCS values, where consistent with the designating legislation or proclamation.		Matt/Amber to respond and edit document as necessary. Any edits to this section in the Executive Summary should also be made in Chapter 1.
11.	ES-07	12-18	Mayberry	These lines repeat the bullet above on lines 4-11	A	Lines 12-18 deleted
12.	ES-11	13-17	Mayberry	Recommend adding a statement regarding whether the suspensions	A	Added the following statement: These suspensions primarily occurred by decisions

[1]For EMPSi use:
A = comment accepted; document changed as recommended
R = comment rejected w/ explanation
M = document changed due to comment but in a different manner than suggested

BLM Washington Office Comments on Administrative Draft MMP-A/EIS (January 2017)

Cmt #	Page #	Line #/Table #/ Figure #	WO Commenter	Comment	A/R/M[1]	Response
				of grazing use came primarily before creation of the monument, or if by agreement rather than decision (if known)		prior to establishment of GSENM. Also added to Chapters 2 and 3.
13.	ES-12	16-19	Mayberry	Suggest edit for clarification: "This alternative would reduce grazing to below average actual use, which is 41,343 AUMs based on a 19-year average (1996-2014). There are several allotments that would be unavailable under this alternative where the permittee currently takes nonuse in most years, which contributes to an average actual use that is much lower than active use, which is 76,957 AUMs."	A	Change made and change tracked through to Chapter 2.
14.	ES-15 and ES-30 2-5 and 2-76	Table ES-2 and Table ES-3 Vegetation Table 2-1 and Table of Comparative Summary of Environmental Consequences	Mayberry	You may need to be prepared to explain the difference between "Acres available per AUM" (Table ES-2 and Table 2-1) and "Acres per AUM" (Table ES-3 and Table of Comparative Summary). Some readers may not realize the difference between stocking rate and carrying capacity.	M	Row headings checked for consistency and discussion of density removed from the Summary Impacts tables. Please see Section 4.1.2 on page 4-4 beginning at line 34 for the supporting rationale as to why this was done.
15.	ES-20 And 2-10	Table ES-2, Alternative C And Table 2-1, Alternative C	Mayberry	"When grazing occurs during the growing season, at a minimum there will be 6 weeks between the date of when grazing use begins ends(?) one year and the date of when grazing use b i s the following year. If this is not possible in a particular area, the area will be rested every other year. During winter grazing, use rest rotation and do not graze an area more than two out of three years." Or does the	A	The text in the summary tables in ES and Chapter 2 reads: When grazing occurs during the growing season, there will be a minimum 6 week deferment between the date of when grazing use begins one year and the date of when grazing use begins the following year. If this is not possible in a particular area, the area will be rested every other year. The text in the detailed alternative table provides an example and now reads: In GSENM and Glen Canyon, when grazing

[1]For EMPSi use:
A = comment accepted; document changed as recommended
R = comment rejected w/ explanation
M = document changed due to comment but in a different manner than suggested

EMPS inc.

BLM Washington Office Comments on Administrative Draft MMP-A/EIS (January 2017)

Cmt #	Page #	Line #/Table #/ Figure #	WO Commenter	Comment	A/R/M[1]	Response
				original mean a six-week deferment of the starting date in the second year? If so, I would suggest replacing the sentence with: "When grazing occurs during the growing season, there will be a minimum six week deferment of the date grazing begins on the following year."		occurs during the growing season, there will be a minimum 6 week deferment between the date of when grazing use begins one year and the date of when grazing use begins the following year (for example, Year 1, grazing during the growing season starts on March 1; Year 2, grazing during the growing season starts April 15). Avoid grazing an area at the same time every year. If this is not possible in a particular area, the area will be rested every other year (for example, Year 1, grazing during the growing season; Year 2, rest; Year 3, graze during the growing season).
16.	ES-25	Table ES-2, Alternative C	Mayberry	When voluntarily relinquished or otherwise retired, grazing preference may be eliminated in allotments or pastures with Monument objects that are not compatible with or are impacted by livestock grazing (e.g., biological soil crust, riparian areas, declining native plant or wildlife species).	A	Change made and tracked through to Chapter 2.
17.	ES-30 and ES-31	Table ES-3 Alternative D	Mayberry	Both of the following statements appear in the section on vegetation impacts for Alternative D. "Therefore, because more livestock would be on the landscape, there is an increased likelihood that grazing would impact vegetation, making it increasingly difficult to meet BLM Utah Rangeland Health Standards in GSENM and Glen Canyon and additional NPS desired vegetation standards in Glen Canyon, compared with Alternative A." and "Changes in livestock management and the use of a variety of vegetation		Impacts analysis for Alternative D has been revised for consistency.

[1]For EMPSi use:
A = comment accepted; document changed as recommended
R = comment rejected w/ explanation
M = document changed due to comment but in a different manner than suggested

BLM Washington Office Comments on Administrative Draft MMP-A/EIS (January 2017)

Cmt #	Page #	Line #/Table #/ Figure #	WO Commenter	Comment	A/R/M[1]	Response
				treatment methods would reduce the impact of grazing on vegetation and improve the likelihood for meeting BLM Utah Land Health Standards in GSENM and Glen Canyon and additional NPS rapid assessment methods in Glen Canyon compared to Alternative A."		
18.	ES-33	Table ES 3 row 1	Wick	See general comments 1 and 2 above -- "wilderness characteristics" by definition only applies to WSAs the name is very similar to "wilderness character" protection in designated wilderness but they have very important differences related to management and allowable uses. Please separate throughout.	A	Separated discussion throughout.
19.	ES-33	Table ES-3 Alternative A	Mayberry	"There are six livestock grazing allotments in the decision area that do not meet Standard 1, and livestock grazing was determined to be the cause on all six allotments. In these allotments, 379,400 acres (17 percent of the decision area) would continue to be available for livestock grazing (BLM GIS 2014). but grazing would be managed or adjusted to make significant progress toward achievement of the Standard" or add this passage from Alternative B: "Since 2006, the BLM, in coordination with permittees, has	A	Added text from Alternative B to Alternative A; also changed in Chapter 2. (Since 2006, the BLM, in coordination with permittees, has made changes in the six allotments, resulting in progress toward meeting standards.)

[1]For EMPSi use:
A = comment accepted; document changed as recommended
R = comment rejected w/ explanation
M = document changed due to comment but in a different manner than suggested

EMPS

BLM Washington Office Comments on Administrative Draft MMP-A/EIS (January 2017)

Cmt #	Page #	Line #/Table #/ Figure #	WO Commenter	Comment	A/R/M[1]	Response
				made changes in the six allotments, resulting in progress toward meeting standards. f Need to be clear that livestock grazing management will still be in compliance with regulation rather than let reader presume that we will continue to manage in a way that precludes meeting Standard 1		
20.	ES-34	Table ES-3 Alternative A	Mayberry	Same as preceeding comment. No action alternative does not preclude following regulation.	A	Added the following text to Alternative A (also changed in Chapter 2): Since 2006, the BLM, in coordination with permittees, has made changes in the six allotments, resulting in progress toward meeting standards.
21.	ES-37	Table ES-3 Alternatives A and C Recreation Impacts	Mayberry	I am confused by the discussion on density and intensity of impacts. In my mind, 50 acres per AUM means more acres are available and impacts would be less intense than Alternative C where there are 25 acres available per AUM. Under Alternative A, more area would be available for grazing and livestock use would be more widely distributed than under Alternative C. In addition, Alternative A appears to use the level of grazing under average actual use, but Alternative C uses active AUMs.	M	Discussion of density removed from the Summary Impacts table. Please see Section 4.1.2 on page 4-4 beginning at line 34 for the supporting rationale as to why this was done.
22.	1-16	11	Mayberry	Too many 9's in the date	A	Changed to 1996
23.	1-17		Mayberry	Suggest adding Public Rangelands Improvement Act, 1978 to the list of authorities	A	Added: "Public Rangelands Improvement Act of 1978 (43 USC Section 1901-1908)"
24.	1-17	24	Damone	I suggest this list should include NAGPRA and AIRFA.	A	Added.
25.	1-17	Section 1.6	wick	Add Congressional Grazing	M	Added the Arizona Wilderness Act of 1984

[1]For EMPSi use:
A = comment accepted; document changed as recommended
R = comment rejected w/ explanation
M = document changed due to comment but in a different manner than suggested

BLM Washington Office Comments on Administrative Draft MMP-A/EIS (January 2017)

Cmt #	Page #	Line #/Table #/ Figure #	WO Commenter	Comment	A/R/M[1]	Response
				Guidelines for Designated Wilderness (see: http://www.wilderness.net/grazing#) and the Paria Canyon/Vermilion Cliffs Wilderness enabling legislation -- and Wilderness Plan if it has any decisions that would affect grazing		(Public Law 98-406) establishing the Paria Canyon-Vermilion Cliffs Wilderness to Section 1.5.4. Added Appendix A of the Committee on Interior and Insular Affairs of the House of Representatives accompanying HR 2570 of the 101st Congress (commonly called the Congressional Wilderness Grazing Guidelines) to Section 1.5.4 Added the Paria Canyon-Vermilion Cliffs Wilderness Plan to Section 1.7.
26.	1-18		Mayberry	Suggest adding Public Rangelands Improvement Act, 1978 to the list of authorities	A	Added: "Public Rangelands Improvement Act of 1978 (43 USC Section 1901-1908)"
27.	1-19	36-37	Mayberry	Recommend using the definition for land health standards from Handbook 4180-1: "Standards of land health are expressions of levels of physical and biological condition or degree of function required for healthy lands and sustainable uses, and define minimum resource conditions that must be achieved and maintained." Desired conditions may be higher level than the minimum required for ecosystem component functionality.	A	Paragraph revised to: "These standards and guidelines were developed in accordance with 43 CFR, Part 4180, to provide for conformance with the Fundamentals of Rangeland Health (above). Through conformance and attainment of Utah's Standards and Guidelines, the Utah BLM ensures that the Fundamentals of Rangeland Health are met. Standards of land health are expressions of levels of physical and biological condition or degree of function required for healthy lands and sustainable uses, and define minimum resource conditions that must be achieved and maintained. Desired conditions may be a higher level than the minimum required for ecosystem component function. Guidelines are the grazing management approaches, methods, and practices that are intended to achieve a standard."
28.	1-19	38	Mayberry	Guidelines are the grazing management approaches, methods, and practices that are intended to	A	Change made

[1]For EMPSi use:
A = comment accepted; document changed as recommended
R = comment rejected w/ explanation
M = document changed due to comment but in a different manner than suggested

BLM Washington Office Comments on Administrative Draft MMP-A/EIS (January 2017)

Cmt #	Page #	Line #/Table #/ Figure #	WO Commenter	Comment	A/R/M[1]	Response
				achi a standa d		
29.	1-21	19	Damone	I suggest this list include the 8100 (cultural resources) and 1780 (tribal consultation) Manuals and Handbooks	A	Added the following bullets, and the corresponding references to end of chapter: • Manual 8100, The Foundations for Managing Cultural Resources (BLM 2004). This manual is intended as a reference source to provide BLM managers with basic information and general summary guidance for managing cultural resources. • Manual 1780, Tribal Relations (BLM 2016a). This manual defines the policies, roles and responsibilities, and standards for BLM tribal relations and government-to-government tribal consultation within a comprehensive framework of those legal authorities affecting this relationship. • Handbook H-1780-1, Improving and Sustaining BLM-Tribal Relations (BLM 2016b). This handbook addresses a broad range of legal authorities and agency programs of interest to tribes and also highlights BLM responsibilities.
30.	1-27	12	Damone	This could be a place to minimally introduce the draft programmatic agreement related to cultural resources that will be completed in association with the EIS.	M	Added to Section 1.6.1 under *Other*.
31.	2-006	Table 2-1 row 1	wick	*"Maintain and/or restore with native and nonnative species; allow new seedings using native and nonnative plants consistent with BLM Manual 1745."* Add consistent with manuals 6330 (6340 too) also have a more detailed discussion of any grandfathered pre-FLPMA seedings	A	Added reference to 6330 and 6340 in Chapter 2. Added the following footnote in Chapter 3 related to the 4,600 acres of treatment: Most of the 4,600 acres of seedings in WSAs are rehabilitation treatments for fire, for example the treatment in the Lake

[1]For EMPSi use:
A = comment accepted; document changed as recommended
R = comment rejected w/ explanation
M = document changed due to comment but in a different manner than suggested

BLM Washington Office Comments on Administrative Draft MMP-A/EIS (January 2017)

Cmt #	Page #	Line #/Table #/ Figure #	WO Commenter	Comment	A/R/M[1]	Response
				in WSAs and wilderness in chapter 3 to provide a baseline for what would be permissible, particularly under alternative D where the primary purpose is to increase livestock forage/stocking. Looks like approx. 4600 acres were treated in WSAs in the past are these pre FLPMA, were they native seedings, mechanical or hand?		allotment, or oil well exploration sites and not historical seedings for livestock forage. On **Figure 3-21**, those seedings on the edges of WSAs are more likely to be historical seedings for livestock forage and those seedings in more central portions of WSAs are more likely to be rehabilitation treatments. Added the following text regarding the nonstructural range improvements in WSAs: Nonstructural range improvements for forage production (historical seedings) were all originally done by mechanical means, primarily chaining. They also used nonnative seed, either crested wheatgrass or Russian wildrye. Also add map of existing seedings to Chapter 3.
32.	2-020 and 3-7	18	Ulloa	Introduction or maintenance of nonnative species should be qualified in some form. BLM has a Native Seed Strategy that guides future seeding treatments.	M	No change here because this is the BLM Utah Rangeland Health Standards. Because the Native Seed Strategy is not BLM policy, it is not included. This document does reference BLM Manuals 1740 and 1745 and Handbook H-1740-2, though.
33.	2-021	18	wick	Add highlighted text: "*. . . potential effects on lands with wilderness characteristics have been analyzed in subsequent site-specific NEPA documents.*" (This needs inserted into the above discussion: *The analysis will include reasonably foreseeable cumulative effects from implementing this plan. Also, the analysis will have a range of alternatives including at least one that minimizes or does not impact inventoried wilderness characteristics*)	A	Added the following text: These future site-specific NEPA documents will include a range of alternatives, including at least one that minimizes impacts on or does not impact lands with wilderness characteristics. The analysis in will include reasonably foreseeable cumulative effects from implementing this plan.

[1]For EMPSi use:
A = comment accepted; document changed as recommended
R = comment rejected w/ explanation
M = document changed due to comment but in a different manner than suggested

BLM Washington Office Comments on Administrative Draft MMP-A/EIS (January 2017)

Cmt #	Page #	Line #/Table #/ Figure #	WO Commenter	Comment	A/R/M[1]	Response
				Note: I know you are not identifying site specific treatments as part of this amendment, but we need to be sure to look at cumulative impacts which would most likely be caused by non-native and mechanical seeding under alt D and an associated RFD for how extensive the treatments would be.		
34.	2-022	28-30	Mayberry	"If the determination documents that land health standards are not being achieved and a significant causal factor for failure to achieve is livestock or grazing management practices, action must be taken to correct the identified issues." Suggested edit uses language from regulation	A	Change made
35.	2-022	30-32	Mayberry	WO IM 2009-007 directs use of the NEPA process to analyze alternatives that will help determine significant causal factors, and potential actions (developed in consultation with permittees and others) to correct the causal factors. Ideally, no additional NEPA would be needed.	A	Changed sentence to read, "There are a number of actions that resource managers can to correct issues contributing to not meeting land health standards."
36.	2-026	22-27	Kristy Swartz, Fire & Aviation	In reading through the document I'm unclear if direction from the September, 2005 Land Use Plan Amendment for Fire and Fuels Management (UT-USO-04-01) was brought forward into the No Action Alternative. This amendment provided updated Goals and Objectives for Fire Management, described Desired Wildland Fire		Amber will get from Cedar City. Awaiting further instruction. *Because we are not changing decisions related to fire management, this should be a nonissue, with, perhaps, the exception noted in the other fire-related comment on Alternative A.*

[1]For EMPSi use:
A = comment accepted; document changed as recommended
R = comment rejected w/ explanation
M = document changed due to comment but in a different manner than suggested

BLM Washington Office Comments on Administrative Draft MMP-A/EIS (January 2017)

Cmt #	Page #	Line #/Table #/ Figure #	WO Commenter	Comment	A/R/M[1]	Response
				Conditions, and identified areas where fire may be restored to the ecosystem as well as where the use of fire was not appropriate. I suggest that this be more explicitly included in the EIS.		
37.	2-027 and 28		Mayberry	"This alternative would reduce grazing to below average actual use, which is 41,343 AUMs based on a 19-year average (1996-2014)." The Active AUMs in this reduced grazing alternative are higher than the average actual use (41,343 AUMs) in the no action alternative. They are lower than the Active AUMs in the no action alternative. The average actual use in this alternative is projected to be lower than the average actual use in the no action alternative. The section on Analytical Assumptions (4.1.1 page 4-3, lines 12-16) says analysis is based on active permitted use. Section 4.3.4 (page 4-23, lines 13-16) indicates analysis of effects are based on the projected average actual use for this alternative rather than the permitted active use, which is greater than the current average actual use. There appears to be conflict in the statements about the level of use that is analyzed in Alternative C.	A	Changed text in Chapter 2 (Section 2.4.3) to read: Under this alternative, the active AUMs would be reduced to below active AUMs under current management (Alternative A). Projected average actual use would also be reduced to below current average actual use, which is 41,343 AUMs based on a 19-year average (1996-2014). Confirmed text in Section 4.1.1 is accurate. Deleted paragraph in Section 4.3.4; this should have been removed globally in favor of a general assumption in Section 4.1.1.
38.	2-036	29 2.5.4 Science and Research-based Alternative	Tim Fisher WO410 NM/NCA	GSENM considers the first and second tier of the M6220 and the draft appears to consider the third tier "laboratory for innovative	A	Added a statement to Sections 2.4.4 (Alternative D) and 2.4.5 (Alternative E). This is also brought forward in the same sections in the Executive Summary.

[1]For EMPSi use:
A = comment accepted; document changed as recommended
R = comment rejected w/ explanation
M = document changed due to comment but in a different manner than suggested

BLM Washington Office Comments on Administrative Draft MMP-A/EIS (January 2017)

Cmt #	Page #	Line #/Table #/ Figure #	WO Commenter	Comment	A/R/M[1]	Response
				grazing techniques" via Science and Research-based Alternative as an exclusive alternative and decided not to review. With this alternative not being forwarded it implies not using the monument as a laboratory for innovative grazing. Although other alternatives have elements of laboratory for innovative grazing techniques but not highlighted as such until the table page ES-26 **Science GSENM.** Within the description of 2.4.5 Alternative E BLM and NPS Preferred add a line to highlight use of the monument lands for laboratory for innovative grazing should suffice.		
39.	2-064	Alt A, RM-6 (MMP, p 27)	Kristy Swartz, Fire & Aviation	This text likely should be replaced or at least reconciled with the 2005 Utah Fire and Fuels LUPA and the Desired Wildland Fire Conditions ((Table 2.1), p. 2-5 thru 2-9, 2005 Utah LUPA) described there which addresses the use of fire (natural and management ignited) by vegetation type		Amber will get from Cedar City. Awaiting further instruction. *Note: What Amber sent is not the LUPA file so cannot be correlated with this comment.*
40.	2-082 + 3-110+ 4-72 +	Recreation 3.5 Recreation 4.7 Recreation	D.Morgan	The discussion of recreation settings, objectives and outcomes in the Analysis section uses different terminology than the Affected Environment section. The current monument plan was done under the old recreation planning guidance; therefore the analysis should address the impacts to the achievement of those	M	Per WO direction, updating the MMP with new RMA objectives is outside the scope of this livestock grazing amendment. Chapter 4 is revised so that terminology is consistent with Chapter 3 and objectives from existing plans.

[1]For EMPSi use:
A = comment accepted; document changed as recommended
R = comment rejected w/ explanation
M = document changed due to comment but in a different manner than suggested

BLM Washington Office Comments on Administrative Draft MMP-A/EIS (January 2017)

Cmt #	Page #	Line #/Table #/ Figure #	WO Commenter	Comment	A/R/M[1]	Response
				objectives. There should be consistency in the usage of terms throughout the document. You may want to consider an update to the SRMAs to comply with the current recreation policy. Or if that is not within the scope of this plan amendment, base the analysis on the objectives as defined in the current RMP. Overall, there should be a statement in the analysis and environmental consequences as to whether or not the objectives of the SRMAs can be achieved in each alternative. If not, the alternative should include 1) a new SRMA objective, 2) a change to an ERMA, or 3) removal of the designation. Please contact dmorgan@blm.gov for questions or assistance!		
41.	2-095	Figure 2-1	Brian Novosak	Recommend putting "yes" "no" at decision points (e.g., the choice between Alt A,D&E or Alt C)	R	No change. The figure already includes "yes" and "no" where relevant. "Yes" and "no" are not applicable after "analyze following in descending order of priority," because it is not a decision point, but rather shows the distinction between the alternatives.
42.	3-074	08, 9	Ulloa	routine monument operations increase weeds. Add a BMP to use clean equipment to prevent introduction of non-native species.	R	BMPs are added as terms and conditions to site-specific projects.
43.	3-151	29	Ulloa	SSA-5 which addresses vegetation restoration in SS habitats. Add a BMP stating that only native species	R	This section provides the relevant plan-level guidance with respect to special status species and livestock grazing practices. The

[1]For EMPSi use:
A = comment accepted; document changed as recommended
R = comment rejected w/ explanation
M = document changed due to comment but in a different manner than suggested

BLM Washington Office Comments on Administrative Draft MMP-A/EIS (January 2017)

Cmt #	Page #	Line #/Table #/ Figure #	WO Commenter	Comment	A/R/M[1]	Response
				will be planted in SS habitats' when restoring (seeding). Appropriate site specific species will be identified during the project planning process.		BLM may implement additional BMPs for site-specific projects.
44.	3-190	33	Damone	The end of this section is a good place to describe the background behind the formulation of the programmatic agreement related to cultural resources and its intended purpose.	A	Included suggested paragraph related to the PA.
45.	3-195	25	Damone	The description on PFCY should be expanded to generally describe the individual classes within the PFYC.	A	Added descriptions of the individual PFYC classes.
46.	3-196	Table 3-26	Damone	Suggest changing the column labeled "Potential" to the "PFYC Class" of the geologic formation.	A	Change made.
47.	3-207	30	wick	*"On lands with wilderness characteristics, there are paved public roadways and unpaved public and administrative use routes."* These types of maintained roads would normally disqualify an area as having wilderness characteristics the inventory should be updated to remove them from the units or this section rewritten to show that everything except primitive routes are excluded from the units themselves (they could be cherrystemmed)	M	Paragraph deleted
48.	3-211	08	wick	Please see my comments 1 and 2 above untrammeled and natural are not part of the wilderness characteristics definition so are not used to analyze impacts to WSAs as they are for wilderness please	A	Change made.

[1]For EMPSi use:
A = comment accepted; document changed as recommended
R = comment rejected w/ explanation
M = document changed due to comment but in a different manner than suggested

BLM Washington Office Comments on Administrative Draft MMP-A/EIS (January 2017)

Cmt #	Page #	Line #/Table #/ Figure #	WO Commenter	Comment	A/R/M[1]	Response
				separate discussion. The remainder of the discussion looks good for WSAs		
49.	4-025, 4-026	30-33 39-41 (similar suggestion)	Mayberry	"Based on the forage model described in **Appendix D,** estimated forage use (or allocation) would decrease by 33 percent, compared with Alternative A. A maximum of 92,389 AUMs would be permitted, 63,144 of which would be active (18 percent decrease in active AUMs, compared with Alternative A).	M	Revised all to "estimated forage <u>production</u>" under discussion of applicable alternatives in Section 4.3.
50.	4-032	32	Ulloa	Introducing new genetic material. This statement does not seem to follow the Native Seed Strategy.	A	This sentence has been deleted.
51.	4-053 and others, such as 4-66 for water resources, page 4-84, etc	13-18	Mayberry	"There are six livestock grazing allotments in the decision area that do not meet Standard 1, and livestock grazing was determined to be the cause on all six allotments: Circle Cliffs, Coyote, Mollies Nipple, Soda, Upper Paria, and Vermilion. Impacts on soil would occur as described under *Nature and Type of Impacts*. Because livestock grazing would not occur, these six allotments have a higher potential for meeting Standard 1 more quickly under Alternative B than under Alternative A." By regulation, livestock grazing use will be managed to achieve or make progress toward achieving land health standards, so all alternatives will "have potential" to meet all the standards. Some alternatives may allow quicker achievement than other alternatives.	A	Changed globally.

[1]For EMPSi use:
A = comment accepted; document changed as recommended
R = comment rejected w/ explanation
M = document changed due to comment but in a different manner than suggested

EMPS

BLM Washington Office Comments on Administrative Draft MMP-A/EIS (January 2017)

Cmt #	Page #	Line #/Table #/ Figure #	WO Commenter	Comment	A/R/M[1]	Response
				The next paragraph in the document says this better. Please review this statement for other resources and standards.		
52.	4-072	General Recreation Comment	D. Morgan	The analysis should state whether or not the SRMA objectives will still be met under each alternative. To be more specific I would analyze the (1) the impact on the current physical, social and operational recreation settings and (2) whether the corresponding rec objectives and niches to be served would be realized.	M	Revisions made to address impacts on SRMA objectives. However, the analysis does not provide an itemized analysis of impacts on each SRMA objective. Also, for consistency, the analysis was not updated to discuss impacts on the physical, social, or operation settings. Rather, it focuses more broadly on user experience impacts, particularly changes in setting that would affect the quality or quantity of those experiences.
53.	4-118	31	Ulloa	Add Native Seed Strategy after manual number.	M	Added the name of Manual 1745 after first use on page 4-95, line 23. Did not add Native Seed Strategy because it is a strategy, not BLM policy.
54.	4-120	Alt. E Special Status Species	Brian Novosak	The BLM SSS Manual 6840 requires BLM to manage SSS to conserve and recover ESA species and initiate proactive conservation to eliminate threats to BLM-SSS. Alt. E discloses that the negative impacts to SSS will be the same or increase (Section 2.8); while at the same time the species and their habitats are declining (Sections 3.7.2 and 3.8.2). Therefore, these management actions violate BLM policy. Recommend amending the management actions to those that would meet the objective of 6840 Manual.	M	Added an impact common to all alternatives that management would not conflict with the BLM SSS Manual. Revised impacts under the alternatives (Chapter 4) and the impact summary table (Chapter 2.8) as applicable.
55.	4-137	34 - 37	John McCarty	"Visual contrast ratings would be required for proposed projects in VRM Class I and II area, in areas	A	Changed to: Visual contrast ratings would be required for all proposed projects unless it can be demonstrated that the project is out

[1]For EMPSi use:
A = comment accepted; document changed as recommended
R = comment rejected w/ explanation
M = document changed due to comment but in a different manner than suggested

BLM Washington Office Comments on Administrative Draft MMP-A/EIS (January 2017)

Cmt #	Page #	Line #/Table #/ Figure #	WO Commenter	Comment	A/R/M[1]	Response
				that were inventoried as high sensitivity, and areas that were inventoried as scenic quality A on BLM-managed lands. They may also be used for other projects where it would be the most effective design or assessment tool." There have been two IBLA stays on BLM proposed projects because of a lack of a "hard look" at impacts to visual resources. Both were in Utah. The basis for the plaintiff's assertion was the absence of Contrast Rating documentation. The IBLA supported the plaintiff and placed a stay on both projects for a future final decision on adequacy. It may be worth reconsidering when contrast ratings are to be required. I would encourage doing a contrast rating unless it can be demonstrated that the project is out of view from any possible Key Observation Point.		of view from any possible Key Observation Point. They may also be used for other projects where it would be the most effective design or assessment tool.
56.	4-155	Alt A discussion	wick	If current management and developments were considered in the inventory where the units were found to have wilderness characteristics & you are using this as your baseline, I would emphasize that in general there would be very minimal impacts with this alternative as compared to current conditions maybe some associated with new range improvements? (suggestion)	A	Added to end of Alternative A discussion: "While the potential for impacts on lands with wilderness characteristics may occur as described above, overall, the magnitude of these impacts from current grazing management is minimal.
57.	4-158	10	wick	*"Alternative D emphasizes the use of*		This analysis states that the magnitude of

[1]For EMPSi use:
A = comment accepted; document changed as recommended
R = comment rejected w/ explanation
M = document changed due to comment but in a different manner than suggested

EMPS inc.

FOIA001:01673140

BLM Washington Office Comments on Administrative Draft MMP-A/EIS (January 2017)

Cmt #	Page #	Line #/Table #/ Figure #	WO Commenter	Comment	A/R/M[1]	Response
				structural and nonstructural range Improvements for the management of livestock, as compared with Alternative A." I can't find an RFD in the document for a range of acres that may undergo veg treatments under this and other alternatives This can have a major impact on wilderness characteristics especially repeated mechanical treatments/seedings. I know you can't pinpoint specific locations in this unit-wide analysis, but there needs to be an order of magnitude discussion, especially for cumulative impacts. If its somewhere else, you can just reference in this section.		impacts under Alternative D would be greater than under Alternative A. The types of impacts are described under the heading Nature and Type of Effects. A discussion of which alternative is "the most" or "the least" is not included in Chapter 4 because all alternatives need to compare back to Alternative A and the change from current condition [see CEQ 40 Questions, #3; BLM NEPA handbook, Section 6.6.2]. A comparison among the alternatives has been added to the summary comparison of impacts in Chapter 2.
58.	4-165	08	wick	"4.16 BLM WILDERNESS AND WILDERNESS STUDY AREAS AND NPS PROPOSED WILDERNESS" Again, please split WSAs/Wilderness out there is no discussion of management/impact analysis of designated BLM wilderness if there are no impacts, cover in the front of the document and leave BLM wilderness out of the discussion.	A	Discussion separated into separate sections.
59.	4-168	20	wick	The impact analysis needs to be discussed with 1976 as the baseline for WSAs and 1984(?) for Paria Canyon Wilderness Act. Looking at the WSAs -- under all alternatives we need to show that the grazing will not exceed the impacts permitted for grandfathered uses (same manner and degree) or otherwise any changes will meet the non-impairment criteria. Its hard to	M	Because we have to meet the nonimpairment standard, Alternative D would not allow grazing to impair wilderness characteristics. For the wilderness, grazing would not be allowed to increase and there would be no new structural range improvements, so there would not be impacts on the wilderness area. Text revised to state this.

[1]For EMPSi use:
A = comment accepted; document changed as recommended
R = comment rejected w/ explanation
M = document changed due to comment but in a different manner than suggested

EMPS inc.

DOI-2019-10 02104

BLM Washington Office Comments on Administrative Draft MMP-A/EIS (January 2017)

Cmt #	Page #	Line #/Table #/ Figure #	WO Commenter	Comment	A/R/M[1]	Response
				tell if the increased grazing acreage, AUMs and veg treatments would exceed these parameters in any of the alternatives without more information. It seems like alternative D might not meet non-impairment.		
60.	Glossary		Mayberry	All definitions that cite the regulations at 43 CFR 4100 need to use the definitions in the 1995 version. That version was last printed in October 2005 Federal Register. Any version of the 4100 regs found on-line or in Federal Register printed after October 2005 is the enjoined version and not valid. The 1995 regulations and definitions refer to "Conservation Use" which was invalidated by the Tenth Circuit Court, but all other portions of the 1995 regulations are the currently in effect. (You have a good footnote on page 3-5) Definitions in the Glossary for the following terms need to be addressed: Active Use Grazing Lease (you might note that Utah does not have any public lands that qualify for a grazing lease as defined in 43 CFR 4100.0-5)(Is the Park Service grazing authorized by Permit or Lease?) Grazing Permit Grazing Preference Suspension Temporary nonuse	A	Glossary definitions have been revised for the indicated terms with definitions contained in Attachment 1 to IM No. 2009-109. Added clarification in Section 3.1 that there are no grazing leases in the decision area.
61.	N/A	N/A	John McCarty	I have no other comments, except to offer a compliment to its well-written nature. Good work.	n/a	Thank you.

[1]For EMPSi use:
A = comment accepted; document changed as recommended
R = comment rejected w/ explanation
M = document changed due to comment but in a different manner than suggested

BLM Washington Office Comments on Administrative Draft MMP-A/EIS (January 2017)

[1]For EMPSi use:
A = comment accepted; document changed as recommended
R = comment rejected w/ explanation
M = document changed due to comment but in a different manner than suggested

Appendix E

National Historic Preservation Act Section 106 Programmatic Agreement

Appendix E
National Historic Preservation Act Section 106 Programmatic Agreement

This is a placeholder for the Programmatic Agreement.

This page intentionally left blank.

Index

INDEX

This page intentionally left blank.

DON'T DELETE THIS PAGE – NECESSARY FOR INDEX GENERATION
(throw away/delete from PDF)

{ RD "201701_1_Intro_ADEIS_WO-Rvw.docx" \f **}**
{ RD "201701_2_Alts_ADEIS_WO-Rvw.docx" \f **}**
{ RD "201701_3_AE_ADEIS_WO-Rvw.docx" \f **}**
{ RD "201701_4_EC_ADEIS_WO-Rvw.docx" \f **}**
{ RD "201701_5_ConsultCoord_ADEIS_WO-Rvw.docx" \f **}**

Chapter 2
Alternatives

TABLE OF CONTENTS

Chapter | Page

TABLES

Page

FIGURES

Page

This page intentionally left blank.

2. ALTERNATIVES

CHAPTER 2
ALTERNATIVES

2.1 INTRODUCTION

This chapter describes the alternatives evaluated in this MMP{ XE "Monument Management Plan, Grand Staircase-Escalante National Monument (MMP 2000)" }-A/EIS. **Section 2.1**, Introduction, includes a comparison table that provides a summary of the alternatives and shows the main differences among the alternatives and identifies the preferred alternative. **Section 2.2** describes the elements that are common to all alternatives. **Section 2.3** describes the allotments or areas that are unavailable under all alternatives. **Section 2.4** provides a description of each alternative evaluated in detail, while **Section 2.5** describes those alternatives considered but not evaluated in detail. **Section 2.6** contains the goals, objectives, and actions associated with each alternative. This is the largest section of the chapter and contains the details of each alternative.

This land use plan amendment is focused on livestock grazing, and only actions associated with livestock grazing management are considered in this amendment. **Appendix A** has the existing MMP{ XE "Monument Management Plan, Grand Staircase-Escalante National Monument (MMP 2000)" } (BLM 2000) decisions and agency policy relevant to livestock grazing; these would not be modified or changed by any of the alternatives. Existing decisions from the MMP that may be amended are noted in **Section 2.7**, Detailed Comparison of Alternatives. Livestock grazing management in Glen Canyon is guided by the Glen Canyon GzMP{ XE "Grazing Management Plan, Glen Canyon (GzMP 1999)" } (NPS 1999) and is also constrained by decisions in the Glen Canyon GMP{ XE "General Management Plan, Glen Canyon (GMP 1979)" } (NPS 1979) and NPS management policies.

Appendix B contains existing plan decisions and policy relevant to livestock grazing in Glen Canyon; these would not be modified or changed by any of the alternatives. Decisions that may be amended are provided in **Section 2.7**.

In addition to the existing decisions identified in the appendices, both the BLM and NPS must comply with numerous federal laws and agency regulations when preparing and implementing management plans (see **Section 1.6**, Relationship to Laws and Agency Regulations, Policies,

Plans, and Programs). The requirements related to these laws and regulations are not restated here but were consulted when preparing the MMP{ XE "Monument Management Plan, Grand Staircase-Escalante National Monument (MMP 2000)" }-A alternatives. Compliance with these laws and regulations is common to all alternatives.

Throughout this document, including the summary comparison table, acreages have been rounded to the nearest 100 acres.

Types of BLM and NPS Decisions

There are two levels of decision-making: planning-level decisions and implementation-level decisions. The MMP{ XE "Monument Management Plan, Grand Staircase-Escalante National Monument (MMP 2000)" }-A includes only planning-level decisions that guide future implementation-level activities. For BLM-managed lands outside of GSENM where GSENM administers livestock grazing (i.e., portions of KFO and ASFO), only the land use allocations described herein are applicable to those areas; the goals and objectives, management actions, and allowable uses apply only to BLM-managed lands in GSENM. The goals and objectives, management actions, and allowable uses in KFO and ASFO will continue, in accordance with their respective RMPs.

Planning-level Decisions

Planning-level decisions represent the goals and objectives for the planning area and the actions needed to achieve them. These decisions guide future land management actions and subsequent site-specific implementation decisions.

Goals and Objectives: The MMP{ XE "Monument Management Plan, Grand Staircase-Escalante National Monument (MMP 2000)" }-A must identify goals and objectives that direct the BLM actions to meet legal mandates, regulatory responsibilities, national policy, BLM State Director guidance, and other resource or social needs. Goals are broad statements that define desired outcomes. Objectives, usually quantifiable and measurable, define specific desired outcomes in this planning effort for livestock grazing and are considered necessary to achieve the overarching goal. The alternatives matrix provides specific goals and objectives for the MMP-A that are being considered in the Draft EIS.

Management Actions and Allowable Uses: Management actions and allowable uses describe actions the BLM or NPS would take to meet the goals and objectives and achieve the desired outcomes. These specific actions are listed in the alternatives matrix.

Land Use Allocations: Land use allocations are decisions that describe geographic areas for specific resources or uses, such as which areas would be available or unavailable for livestock grazing. Allocations have geographic boundaries and are shown on figures provided at the end of this chapter.

Implementation-level Decisions

Implementation-level decisions are management actions tied to a specific location and are used to implement planning-level decisions. This MMP{ XE "Monument Management Plan, Grand Staircase-Escalante National Monument (MMP 2000)" }-A/EIS does not make implementation-level decisions but does provide guidance and general direction for these decisions. Unlike

planning-level decisions, implementation-level decisions are not subject to protest under the planning regulations. Most implementation-level decisions are developed following adoption of a land use plan and require additional site-specific NEPA{ XE "National Environmental Policy Act (NEPA)" } analysis.

Examples of implementation-level decisions for livestock grazing are as follows:

- Adjusting stocking rates{ XE "Stocking Rate" } for land use plan goals and objectives
- Authorization for cooperative range improvements{ XE "Range Improvement" }
- Implementing methods to distribute livestock use to improve land health
- Maintenance of structural improvements to maintain the integrity of grazing systems
- Implementing by permit appropriate measures to assure cattle distribution and rangeland utilization{ XE "Utilization" } (e.g., requirements to use a range rider{ XE "Range Rider" })
- Livestock grazing arrangements or systems, such as
    - Multiple allotments combined into a single allotment or the allotment boundaries are otherwise changed
    - Distribution of range improvements{ XE "Range Improvement" }
    - Rest-rotation systems
    - Deferred rotation systems

Table 2-1, below, provides an overview of the differences between the alternatives, and the rest of this chapter describes the alternatives in detail.

Commented [BSB1]: Cindy: please check that these two bullets are not separated onto different pages

Table 2-1
Summary Comparison of Alternatives

	Alternative A	Alternative B	Alternative C	Alternative D	Alternative E
Theme	Continue current management direction. Livestock grazing continues at current permitted levels. Areas currently closed remain unavailable to grazing.	Discontinue livestock grazing in the decision area, including GSENM and Glen Canyon, with 2-year notification. Permittees provided compensation for improvements.	Emphasize native species diversity. Livestock grazing managed or discontinued to reduce conflicts to resources. Changes in grazing systems (e.g., season of use, intensity, and rotation) considered before implementing range improvements{ XE "Range Improvement" }. Provide large ungrazed reference areas.	Emphasize healthy landscapes to support multiple uses. Derived from State and County ordinances and plans. Livestock management promotes land health through adaptive management principles and innovative livestock practices. Some unavailable allotments become available and suspended{ XE "Suspension" } AUMs are returned to active use during permit renewal.	Emphasize sustainable yield through livestock management designed to ensure BLM Utah Rangeland Health{ XE "Rangeland Health" } Standards are achieved, as well as other applicable criteria on NPS-managed lands, and land health is improved. Provide for reserve common allotments{ XE "Reserve Common Allotment" }.
Area and AUMs Available for Grazing					
Total Available (acres)	2,089,000	0	1,619,700	2,135,200	2,065,300
Available (acres)	2,074,400	0	1,619,700	2,135,200	2,045,800
Reserve Common Allotment (acres)	14,600	0	0	0	19,500
Active AUMs	76,957	0	63,144	107,955	76,520
Suspended{ XE	29,245	0	29,245	0	29,245

Table 2-1
Summary Comparison of Alternatives

	Alternative A	Alternative B	Alternative C	Alternative D	Alternative E
"Suspension" } AUMs					
Maximum Permitted AUMs[1]	106,202	0	92,389	107,955[2]	105,765
Average Actual Use AUMs[3]	41,343	0	33,368	42,885	40,100
Acres available per active AUM	27	0	26	20	27
Acres available per AUM, based on average actual use	51	0	49	50	52
Area (acres) Unavailable for Grazing					
Total Unavailable:	153,000	2,242,000	622,300	106,800	176,700
Trailing Only:{ XE "Trailing Only" }	15,700	0	15,200	0[4]	15,200
Glen Canyon unavailable:	88,700 Includes all or portions of Big Bowns Bench, Escalante River, Harvey's Fear, Navajo Bench, Rock Creek-Mudholes, and	318,800 (all allotments)	150,200 Includes all or portions of Big Bowns Bench, Escalante River, Fortymile Ridge, Harvey's Fear, Lake, Lower Warm Creek,	90,300 Includes all or portions of Big Bowns Bench, Escalante River, Harvey's Fear, Navajo Bench, Spencer Bench, and Unallotted	95,300 Includes all or portions of Big Bowns Bench, Escalante River, Harvey's Fear, Lake, Navajo Bench, Rock Creek-Mudholes, Spencer

[1] For Alternative A, "Maximum Permitted AUMs" reflects the total number of permitted AUMs under the existing MFPs, as amended. For Alternative D, this row is the total number of permitted AUMs under the existing MFPs, as amended, plus AUMs associated with newly available allotments or pastures. For Alternatives C and E, this row is current permitted use less the number of AUMs associated with unavailable allotments or pastures under the alternative.
[2] Currently suspended{ XE "Suspension" } AUMs would be restored at permit renewal.
[3] Average actual use is based on a 19-year average for Alternative A. For the other alternatives, this row is an estimate, based on current average actual use and changes in AUMs associated with areas available and unavailable for grazing. For analysis, the average actual use is assumed to remain static over the life of the plan. Average actual use is provided for comparison only and is not a planning-level decision.
[4] Trailing would be allowed under Alternative D; however, the zero in the column indicates that there are no allotments that would be restricted to trailing only{ XE "Trailing Only" }.

Table 2-1
Summary Comparison of Alternatives

	Alternative A	Alternative B	Alternative C	Alternative D	Alternative E
	Spencer Bench		Navajo Bench, Rock Creek-Mudholes, Spencer Bench, and Unallotted areas in Glen Canyon	areas in Glen Canyon	Bench, and Unallotted areas in Glen Canyon
Nonstructural Range Improvements{ XE "Range Improvement" } GSENM	Maintain and/or restore with native and nonnative species consistent with MMP{ XE "Monument Management Plan, Grand Staircase-Escalante National Monument (MMP 2000)" } and BLM Manuals 1745, 6330, and 6340.	Restore with native species consistent with MMP{ XE "Monument Management Plan, Grand Staircase-Escalante National Monument (MMP 2000)" } and BLM Manuals 1745, 6330, and 6340.	Maintain and/or restore with native species consistent with MMP{ XE "Monument Management Plan, Grand Staircase-Escalante National Monument (MMP 2000)" } and BLM Manuals 1745, 6330, and 6340.	Maintain and/or restore with native and nonnative species; allow new seedings{ XE "Seeding" } using native and nonnative plants consistent with BLM Manuals 1745, 6330, and 6340.	Maintain and/or restore with native and nonnative species consistent with BLM Manuals 1745, 6330, and 6340.
	Follow MMP.{ XE "Monument Management Plan, Grand Staircase-Escalante National Monument (MMP 2000)" }	Same as Alternative A.	Passive restoration and non-chemical methods will be the priority for preventing the introduction, establishment, and/or spread of noxious weeds{ XE "Noxious Weed" } and/or nonnative, invasive species.{ XE "Invasive Species" }	Where not otherwise constrained by special designations, allow a variety of vegetation restoration methods, including mechanical, chemical, biological, and prescribed fires.	
	Livestock grazing after native seedings{ XE "Seeding" } are	N/A	Livestock grazing after native seeding{ XE "Seeding" }	Same as Alternative E.	After disturbance, modify livestock grazing practices until

Table 2-1
Summary Comparison of Alternatives

	Alternative A	Alternative B	Alternative C	Alternative D	Alternative E
	established will be modified to ensure the survival of the native plants. The livestock exclusion period required to allow establishment of seeded native species and recovery of surviving plants after a wildfire may be more than two years. Site evaluation will be required to determine when the native seedings should be grazed again and the effectiveness of the current or new grazing system on the persistence of native plants.		restoration will be modified to ensure the survival of the native plants. Post-disturbance, suspend livestock grazing for at least two growing seasons or until the majority of native plant species in the area have seeded, whichever is longer. Site evaluation will be required to determine when the native seedings should be grazed again and the effectiveness of the current or new grazing system on the persistence of native plants.		seedings{ XE "Seeding" } are established in order to promote the survival of plants. Generally, areas will be rested from livestock grazing for two growing seasons or until site objectives are met. Site evaluation will be required to determine when objectives for the seedings are met and grazing can be resumed.
Nonstructural Range Improvements{ XE "Range Improvement" } **Glen Canyon**	Nonstructural range improvements{ XE "Range Improvement" } and land treatments are not appropriate in Glen Canyon. Management-ignited fires will only be allowed for special	Same as Alternative A.	Same as Alternative A.	Same as Alternative A.	Same as Alternative A.

Table 2-1
Summary Comparison of Alternatives

	Alternative A	Alternative B	Alternative C	Alternative D	Alternative E
	circumstances, such as to control potentially new invasive exotic species.{ XE "Exotic Species" }				
Structural Range Improvement{ XE "Range Improvement" } **GSENMs: General** *(includes, but not limited to, fences, cattle guards, corrals, and cabins)*	Authorize structural range improvements{ XE "Range Improvement" } outlined in the MFPs within constraints of the MMP.{ XE "Monument Management Plan, Grand Staircase-Escalante National Monument (MMP 2000)" }	Evaluate structural range improvements{ XE "Range Improvement" } associated with livestock grazing for utility, historical significance, or other purposes and remove unless needed to meet objectives for natural and cultural resources.	Authorize structural range improvements{ XE "Range Improvement" } consistent with the MMP.{ XE "Monument Management Plan, Grand Staircase-Escalante National Monument (MMP 2000)" }	Authorize structural range improvements{ XE "Range Improvement" }. Maintain structural range improvements{ XE "Range Improvement" } so that forage reserves will be ready for use when needed.	Authorize structural range improvements{ XE "Range Improvement" } consistent with the MMP.{ XE "Monument Management Plan, Grand Staircase-Escalante National Monument (MMP 2000)" }
Structural Range Improvements{ XE "Range Improvement" } **Glen Canyon: General**	New line cabins (i.e., cabins) are not appropriate in Glen Canyon.		Same as Alternative A.	New line cabins would be considered within Glen Canyon outside of proposed wilderness areas. Proposals would be evaluated on a case-by-case basis via an appropriate NEPA{ XE "National Environmental Policy Act (NEPA)" } and National Historic Preservation Act{ XE "National Historic Preservation Act (NHPA)" } process.	
Structural Range Improvements{ XE "Range Improvement" } **GSENM: Water** *(includes pipelines, troughs, detention and*	Water developments can be used as a management tool throughout the Monument for the following purposes: 1)		Where water developments are necessary for livestock grazing and protection of Monument objects,	Authorize water developments for the following purposes: 1) Better distribution of livestock when deemed to have an overall beneficial effect on Monument resources, including water sources or riparian areas{ XE "Riparian Area" }, or to restore or manage	

Table 2-1
Summary Comparison of Alternatives

	Alternative A	Alternative B	Alternative C	Alternative D	Alternative E
retention ponds, drainage ditches)	Better distribution of livestock when deemed to have an overall beneficial effect on Monument resources, including water sources or riparian areas{ XE "Riparian Area" }, or to restore or manage native species or populations. 2) They can be done only when NEPA{ XE "National Environmental Policy Act (NEPA)" } analysis determines this tool to be the best means of achieving the above objectives and when the water development would not dewater streams or springs.{ XE "Spring" } 3) Developments will not be permitted to increase overall livestock numbers. 4) Maintenance of existing development can continue, but may		such developments will: 1) Be fenced and will protect associated wetland/{ XE "Wetland" }riparian resources. 2) On/off valves will ensure that water remains in its natural course/site at all times livestock are not present in the allotment/pasture. 3) Float valves would be used during the grazing season.	native species or populations. 2) They can be done only as a means of achieving MMP{ XE "Monument Management Plan, Grand Staircase-Escalante National Monument (MMP 2000)" } objectives and only when the water development would not dewater streams or springs.{ XE "Spring" } 3) Exceptions would be allowed on a temporary basis such as to fill troughs or storage tanks.	

Table 2-1
Summary Comparison of Alternatives

	Alternative A	Alternative B	Alternative C	Alternative D	Alternative E
	require NEPA analysis and must be consistent with objectives of this plan.				
Structural Range Improvements{ XE "Range Improvement" } Glen Canyon: Water	All water developments must consider the needs of wildlife and recreation and will not be constructed, maintained, or utilized in such a way as to preclude the access to that source by wildlife or recreation users. When grazing permits{ XE "Permit, Grazing" } are canceled or modified for other than public purposes, existing range improvements{ XE "Range Improvement" } will be evaluated for abandonment or removal. Removal may be completed by the benefitting party, owner, or agency.	Evaluate structural range improvements{ XE "Range Improvement" } associated with livestock grazing for utility, historical significance, or other purposes and remove unless needed to meet objectives for natural and cultural resources.	New water developments would be considered within Glen Canyon outside of the proposed wilderness area. Proposals would be evaluated on a case-by-case basis via an appropriate NEPA{ XE "National Environmental Policy Act (NEPA)" } and National Historic Preservation Act{ XE "National Historic Preservation Act (NHPA)" } process.		
Season of Use	Manage season of use	N/A	Adaptively manage	Adaptively manage	Adaptively manage

Table 2-1
Summary Comparison of Alternatives

	Alternative A	Alternative B	Alternative C	Alternative D	Alternative E
GSENM	to meet BLM Utah Rangeland Health{ XE "Rangeland Health" } Standards.		season of use, duration, distribution, and stocking rate{ XE "Stocking Rate" } (AUMs) of livestock grazing to ensure that Goals and Objectives are met.	season of use, duration, distribution, and stocking rate{ XE "Stocking Rate" } (AUMs) to meet BLM Utah Rangeland Health{ XE "Rangeland Health" } Standards. Allow flexibility in permit for season of use (i.e., manage for conditions rather than calendar dates).	season of use, duration, distribution, and stocking rate{ XE "Stocking Rate" } (AUMs) to meet BLM Utah Rangeland Health{ XE "Rangeland Health" } Standards and reduce conflicts with other resources and uses.
			When grazing occurs during the growing season, ~~at a minimum~~ there will be a minimum 6 week~~s~~ deferment between the date of when grazing use begins one year and the date of when grazing use begins the following year. If this is not possible in a particular area, the area will be rested every other year. During winter grazing, use rest rotation and do not graze an area more than ~~two~~ 2 out of ~~three~~ 3 years.		
			Change season of use where livestock grazing overlaps with		

Table 2-1
Summary Comparison of Alternatives

	Alternative A	Alternative B	Alternative C	Alternative D	Alternative E
			high use and/or high value recreation areas.		
			Change season of use for grazing as appropriate for biological soil crust{ XE "Biological Soil Crust" } and soil site degradation susceptibility so that grazing does not occur during times when crusts are most susceptible to damage.		
			Change season of use in allotments with known locations of Ute ladies' tresses so that cattle are not present during sensitive seasons.		
			Change season of use, duration, distribution, and/or stocking rate{ XE "Stocking Rate" } (AUMs) if monitoring for biological soil crust{ XE "Biological Soil Crust" } indicates		

Table 2-1
Summary Comparison of Alternatives

	Alternative A	Alternative B	Alternative C	Alternative D	Alternative E
			more than a moderate departure from reference.		
Season of Use Glen Canyon	Follow Glen Canyon GzMP{ XE "Grazing Management Plan, Glen Canyon (GzMP 1999)" } (1999) – see spring{ XE "Spring" } grazing seasons.	N/A	Adaptively manage season of use, duration, and stocking rate{ XE "Stocking Rate" } (AUMs) of livestock grazing to ensure that NPS Goals and Objectives are met.	Adaptively manage season of use, duration, and stocking rate{ XE "Stocking Rate" } (AUMs) to meet Glen Canyon resource objectives as defined by the NPS Grazing Plan. Allow flexibility in permit for season of use (i.e., manage for conditions rather than calendar dates). Use BLM Utah Rangeland Health{ XE "Rangeland Health" } Standards as supplement to GzMP{ XE "Grazing Management Plan, Glen Canyon (GzMP 1999)" } Goals and Objectives with actions triggered if these drop below Slight-Moderate in three categories; use long-term monitoring plots to determine trend.	Same as Alternative C.

Table 2-1
Summary Comparison of Alternatives

	Alternative A	Alternative B	Alternative C	Alternative D	Alternative E
Riders	Riders are an available tool, but no specific action is identified.	N/A	Where allotments are not meeting or moving toward objectives, a rider will be present five out of every seven days throughout the season of use.	Same as Alternative A.	Same as Alternative A.
Voluntary Relinquishment *(see* ***Figure 2-1****, Voluntary Relinquishment Decision Tree)*	• Comply with BLM policy for voluntary relinquishment (currently Instruction Memorandum No. 2013-184). The Authorized Officer may take one or more of the following actions: • Issue a grazing permit{ XE "Permit, Grazing" } to a different applicant. • Stock with livestock from another allotment with unmet resource objectives. • Combine with an adjacent allotment that has unmet resource	N/A	Same as Alternative A.		

Table 2-1
Summary Comparison of Alternatives

	Alternative A	Alternative B	Alternative C	Alternative D	Alternative E
	objectives. • Consider use of the allotment as a reserve common allotment{ XE "Reserve Common Allotment" } (i.e., continue livestock grazing but do not recognize an individual with preference to the forage). • Amend or revise the land use plan to allocate forage to uses other than livestock grazing. In other words, the land use plan would be amended or revised to allocate the allotment as unavailable for livestock grazing.				
	N/A	N/A	Preference would be for amending the MMP{ XE "Monument Management Plan, Grand Staircase-Escalante National Monument (MMP 2000)" } to allocate	Preference would be for one of the following: • Issue a grazing permit{ XE "Permit, Grazing" } to a different applicant.	N/A

Table 2-1
Summary Comparison of Alternatives

	Alternative A	Alternative B	Alternative C	Alternative D	Alternative E
			forage for a different purpose. When voluntarily relinquished or otherwise retired, grazing preference{ XE "Preference, Grazing" } may be eliminated in allotments or pastures with Monument objects that are not compatible with or are impacted by livestock grazing (e.g., biological soil crust,{ XE "Biological Soil Crust" } riparian areas{ XE "Riparian Area" }, declining native plant or wildlife species) ~~may be eliminated~~.	• Stock with livestock from another allotment with unmet resource objectives. • Combine with an adjacent allotment that has unmet resource objectives.	
Biological Soil Crust and Soil Degradation Susceptibility	Prior to any ground-disturbing activity, the potential effects on biological soil crusts{ XE "Biological Soil Crust" } will be considered and steps	Same as Alternative A.	Biological soil crusts{ XE "Biological Soil Crust" } are protected from trampling and other physical disturbance within at least 60 percent of	Same as Alternative A.	*GSENM:* Same as Alternative A. *Glen Canyon:* Same as Alternative C.

Table 2-1
Summary Comparison of Alternatives

	Alternative A	Alternative B	Alternative C	Alternative D	Alternative E
	taken to avoid impacts on their function, health, and distribution. Follow Glen Canyon GzMP.{ XE "Grazing Management Plan, Glen Canyon (GzMP 1999)" }		their predicted available habitat within GSENM and 80 percent within Glen Canyon.		
	N/A	N/A	Pastures with more than 50 percent of soils with high soil degradation{ XE "Soil Degradation" } susceptibility would be unavailable for livestock grazing.	N/A	*GSENM:* N/A *Glen Canyon:* Same as Alternative C.

Table 2-1
Summary Comparison of Alternatives

	Alternative A	Alternative B	Alternative C	Alternative D	Alternative E
Science GSENM	Follow MMP.{ XE "Monument Management Plan, Grand Staircase-Escalante National Monument (MMP 2000)" } For full details on Science and Research guidance provided in the MMP, see pages 44-46 in the MMP.	Follow MMP;{ XE "Monument Management Plan, Grand Staircase-Escalante National Monument (MMP 2000)" } no opportunities to study active grazing. There would be research associated with the effects of not grazing. The unavailable lands could act as reference areas for similar ecological sites{ XE "Ecological Site" }.	Use science and research to: 1) gain an understanding of the impacts of livestock grazing in the decision area; 2) gain an understanding of the potential for movement of grazed areas toward reference conditions if ungrazed; and 3) distinguish climate impacts from livestock grazing impacts.	GSENM will serve as a laboratory to research innovative grazing techniques. Use science and research to gain an understanding of how to better achieve BLM Utah Rangeland Health{ XE "Rangeland Health" } Standards.	Follow MMP;{ XE "Monument Management Plan, Grand Staircase-Escalante National Monument (MMP 2000)" } GSENM will serve as a laboratory to research innovative grazing techniques and a diversity of grazing practices. Use science and research to gain an understanding of how to better achieve BLM Utah Rangeland Health{ XE "Rangeland Health" } Standards.
			Emphasize the use of large, ungrazed reference areas to provide reference states.	Allow experimental use of electric fences, other fence design, season of use, supplement/salt placement, water developments, and/or vegetation treatments{ XE "Vegetation Treatment" }, including prescribed fire.	Encourage innovation and experimentation. Allow experimentation of grazing techniques and grazing practices to reduce impacts of livestock grazing on all lands available for livestock grazing.
			Monitor ungrazed reference areas to	If ungrazed reference areas are established,	Use ungrazed reference areas to

Table 2-1
Summary Comparison of Alternatives

	Alternative A	Alternative B	Alternative C	Alternative D	Alternative E
			see how they respond under the management conditions of the decision area absent livestock grazing. Monitor reference areas to see how they move toward a reference state.	do not exceed 0.5 percent in any allotment or 0.5 percent within GSENM. Allotments or pastures identified as unavailable for livestock grazing do not count toward the 0.5 percent cap within GSENM.	distinguish climate impacts from livestock grazing impacts.
Science Glen Canyon	Glen Canyon will use science-based information to protect park resources and values.{ XE "Resources and Values (Glen Canyon)" }	No similar action.	Use science and research to 1) gain an understanding of the impacts of livestock grazing in the decision area; 2) to gain an understanding of the potential for movement of grazed areas toward reference conditions if ungrazed; and 3) to distinguish climate impacts from livestock grazing impacts.	No similar action.	Same as Alternative C.
GSENM Objects{ XE "Objects (GSENM)" }	Manage livestock grazing in a manner consistent with the Proclamation. Follow MMP{ XE "Monument	Livestock grazing would be discontinued; impacts would be eliminated.	Reduce livestock grazing in a manner that protects the objects identified in the Proclamation	Same as Alternative A.	Same as Alternative A.

Table 2-1
Summary Comparison of Alternatives

	Alternative A	Alternative B	Alternative C	Alternative D	Alternative E
	Management Plan, Grand Staircase-Escalante National Monument (MMP 2000)" } and BLM policy.		from impacts.		
Glen Canyon Values and Purposes{ XE "Values and Purposes (Glen Canyon)" }	Manage livestock grazing in a manner that protects the values and purposes of Glen Canyon, including soil, vegetation, wildlife, special status species, cultural resources, water, paleontology, recreation, and scenic resources.	Livestock grazing would be discontinued; impacts would be eliminated.	Same as Alternative A.	Same as Alternative A.	Same as Alternative A.

2.2 COMMON TO ALL ALTERNATIVES

2.2.1 Current Management

As previously described, the existing MMP{ XE "Monument Management Plan, Grand Staircase-Escalante National Monument (MMP 2000)" } includes other management decisions relevant to livestock grazing that would not be modified or changed by any alternative, which is summarized in **Appendix A**, Current Management: Grand Staircase-Escalante National Monument.

For Glen Canyon, decisions in the GzMP{ XE "Grazing Management Plan, Glen Canyon (GzMP 1999)" } and GMP{ XE "General Management Plan, Glen Canyon (GMP 1979)" } would generally be the same across all alternatives. The alternatives may note specific decisions for clarification or modification. Pertinent decisions from the GzMP are included in **Appendix B**, Current Management: Glen Canyon National Recreation Area.

BLM Utah Rangeland Health{ XE "Rangeland Health" } Standards

As discussed in **Section 1.5.3**, Planning Criteria{ XE "Planning Criteria" }, the amendment process must use the BLM Utah Standards for Rangeland Health{ XE "Rangeland Health" } and Guidelines for Livestock Grazing Management (BLM 1997). Therefore, all alternatives must meet or make progress toward meeting the BLM Utah Rangeland Health Standards. Other planning criteria common to all alternatives include compliance with applicable laws, regulations, and policy. The four BLM Utah Rangeland Health Standards are described below.

Standard 1: Upland soils exhibit permeability and infiltration rates that sustain or improve site productivity, considering the soil type, climate, and landform. As indicated by:

- Sufficient cover and litter to protect the soil surface from excessive water and wind erosion, promote infiltration, detain surface flow, and retard soil moisture loss by evaporation.
- The absence of indicators of excessive erosion such as rills, soil pedestals, and actively eroding gullies.
- The appropriate amount, type, and distribution of vegetation reflecting the presence of 1) the desired plant community, where identified in a land use plan conforming to these standards, or 2) where the desired plant community is not identified, a community that equally sustains the desired level of productivity and properly functioning ecological conditions.

Standard 2: Riparian and wetland{ XE "Wetland" } areas are in properly functioning condition.[5] Stream channel morphology and functions are appropriate to soil type, climate, and landform. As indicated by:

[5] For Glen Canyon, "properly functioning" does not include exotic species{ XE "Exotic Species" }, only native species.

- Streambank vegetation consisting of, or showing a trend toward, species with root masses capable of withstanding high stream flow events. Vegetative cover adequate to protect streambanks and dissipate stream flow energy associated with high water flows, protect against accelerated erosion, capture sediment, and provide for groundwater recharge.
- Vegetation reflecting: desired plant community, maintenance of riparian and wetland{ XE "Wetland" } soil moisture characteristics, diverse age structure and composition, high vigor, large woody debris when site potential allows, and providing food, cover, and other habitat needs for dependent animal species.
- Revegetating point bars; lateral stream movement associated with natural sinuosity; channel width, depth, pool frequency and roughness appropriate to landscape position.
- Active floodplain.

Standard 3: **Desired species, including native, threatened, endangered, and special status species, are maintained at a level appropriate for the site and species involved. As indicated by:**

- Frequency, diversity, density, age class, and productivity of desired native species necessary to ensure reproductive capability and survival.
- Habitats connected at a level to enhance species survival.
- Native species reoccupy habitat niches and voids caused by disturbances unless management objectives call for introduction or maintenance of nonnative species.
- Habitats for threatened, endangered, and special status species managed to provide for recovery and move species toward de-listing.
- Appropriate amount, type, and distribution of vegetation reflecting the presence of 1) the desired plant community, where identified in a land use plan conforming to these Standards, or 2) where the desired plant community is not identified, a community that sustains the desired level of productivity and properly functioning ecological processes.

Standard 4: **The BLM will apply and comply with water quality standards established by the State of Utah (R.317-2) and the Federal Clean Water and Safe Drinking Water Acts. Activities on BLM-managed lands will fully support the designated beneficial uses described in the Utah Water Quality Standards (R.317-2) for surface and groundwater. As indicated by:**

- Measurement of nutrient loads, total dissolved solids, chemical constituents, fecal coliform, water temperature and other water quality parameters.
- Macro-invertebrate communities that indicate water quality meets aquatic objectives.

Cultural Resources Management Protocol

Under federal law and regulations, there is little discretion in how cultural resources are managed and protected. As a result, a protocol for managing cultural resources in areas with livestock grazing is included in **Appendix C**, Cultural Resources Management Protocol. The protocol outlines the types of cultural resource sites found in the planning area and the various forms of impacts by which these sites are affected. It describes criteria by which Determinations of Effect will be made and a proposal for a grazing-related inventory and monitoring program for cultural resources. The protocol will be implemented under all alternatives, except for Alternative B (no grazing).

Relationship to Recreational Uses

Generally, mechanisms to reduce conflicts between livestock grazing and recreation use are site-specific implementation decisions. These include such mechanisms as hiker mazes, educational signage, fencing, changes in season of use, and changes in livestock grazing levels.

BLM Lands with Wilderness Characteristics

This MMP{ XE "Monument Management Plan, Grand Staircase-Escalante National Monument (MMP 2000)" }-A is a targeted amendment for livestock grazing. Per BLM Manual 6320.06, "a targeted amendment to address a specific project or proposal may not in all circumstances require consideration of an alternative that would protect wilderness characteristics. In these situations, the NEPA{ XE "National Environmental Policy Act (NEPA)" } document associated with the plan amendment must still analyze effects of the alternatives on lands with wilderness characteristics." Prior to authorizing surface-disturbing activities, including nonstructural range improvements{ XE "Range Improvement" }, the BLM will ensure that wilderness characteristics inventories are current and potential effects on lands with wilderness characteristics have been analyzed in subsequent site-specific NEPA documents. These future site-specific NEPA documents will include a range of alternatives, including at least one that minimizes impacts on or does not impact lands with wilderness characteristics. The analysis in will include reasonably foreseeable cumulative effects from implementing this plan. Impacts on known lands with wilderness characteristics are documented in **Chapter 4**.

BLM Wilderness and Wilderness Study Areas

All actions in designated wilderness areas will be subject to the requirements of BLM Manual 6340, and all actions within Wilderness Study Areas will be subject to the requirements of BLM Manual 6330 (or the most current guidance at the time the action is analyzed).

NPS Proposed Wilderness and Potential Wilderness

Proposed and potential wilderness areas in Glen Canyon will be managed according to NPS Management Policies and Director's Order #41: Wilderness Stewardship.

Adaptive Management

The BLM would continue to follow the Framework for Monitoring, Evaluation, and Adaptive Management in Chapter 3 of the MMP{ XE "Monument Management Plan, Grand Staircase-Escalante National Monument (MMP 2000)" } (BLM 2000, pp. 71-72). Adaptive management, as defined here, is a formal process for continually improving management policies and practices by learning from the outcomes of operational programs and new scientific information. This process can be applied at both the land use plan and implementation stages. Under adaptive

management, plans and activities are treated as working hypotheses rather than final solutions to complex problems.

For all allotments or portions of allotments within Glen Canyon, the BLM will administer grazing in accordance with applicable laws and regulations subject to the Glen Canyon enabling legislation and GzMP{ XE "Grazing Management Plan, Glen Canyon (GzMP 1999)" } to ensure that grazing activities are consistent with Glen Canyon values and purposes.

For lands within Glen Canyon,

> "Both NPS and BLM will evaluate resource conditions and initiate mitigation actions as needed to meet the resource objectives in this [Glen Canyon Grazing Management] Plan. NPS will identify unacceptable resource conditions and, if degradation is the result of grazing activities, NPS will request that BLM initiate grazing administrative action(s) to mitigate unacceptable impacts to recreation area resources. BLM will ensure that grazing [in Glen Canyon] is in compliance with the respective Utah and Arizona 'Standards for Rangeland Health{ XE "Rangeland Health" } and Guidelines for Grazing Management'" (NPS 1999, p. 10).

Additional criteria beyond BLM Utah Rangeland Health{ XE "Rangeland Health" } Standards may be required on NPS-managed lands as specified in the 1999 GzMP{ XE "Grazing Management Plan, Glen Canyon (GzMP 1999)" } and other NPS policies.

Rangeland health{ XE "Rangeland Health" } assessments{ XE "Rangeland Health, Assessment" } are used in all components of adaptive management but are primarily associated with monitoring and evaluation components. Rangeland health assessments provide a structured method that allows resource managers to determine the amount of departure from key indicators, defined in the BLM Utah Rangeland Health Standards, an area may have. Once the rangeland health assessments are completed, the information gathered during the assessment is analyzed to evaluate the degree of achievement of land health standards.

Other monitoring data such as utilization{ XE "Utilization" }, long-term trend, precipitation data, and actual use informs the resource manager and enables them to understand both past and present use of the resource and the relationship of those uses to soils, vegetation, wildlife, and ecological processes. This evaluation process also aids in identifying contributing or causal factors{ XE "Causal Factor" } for not achieving a land health standard and provides the baseline rationale in determining what management changes need to occur to provide for proper range management and land health.

Once the evaluation phase is complete, a rangeland health{ XE "Rangeland Health" } determination is made. This is documentation recording the BLM Authorized Officer's findings that existing grazing management practices or levels of grazing use either are or are not significant factors in failing to achieve the standards (H-4180-1, I-3; BLM 2001).

If the determination documents that land health standards are not being achieved and a significant causal factor{ XE "Causal Factor" } for failure to achieve is livestock or grazing management practices, action must be taken to correct the identified issues. There are a

number of actions that resource managers can ~~use within the existing terms and conditions of a grazing permit~~to correct issues contributing to not meeting land health standards~~{ XE "Permit, Grazing" } and others that may require additional NEPA{ XE "National Environmental Policy Act (NEPA)" } analysis~~. Collectively, these actions are often referred to as a tool box for adaptive grazing management.

Possible implementation-level actions of adaptive grazing management are as follows:

- Adjusting stocking rate{ XE "Stocking Rate" } to light, moderate, or heavy grazing intensity
- Implementing alternative riparian grazing dates based on specific conditions (topography, range rider{ XE "Range Rider" }, upland water sources, livestock use patterns)
- Using salt or supplements to draw livestock toward or away from specific areas
- Herding (use of a range rider{ XE "Range Rider" } to move livestock to or away from specific areas)
- Changing the season of use (within permitted AUMs)
- Changing the animal numbers (within permitted AUMs)
- Changing the number of days of livestock use
- Deferring livestock turn-on date
- Resting an area from livestock grazing for one or more seasons
- Not allowing livestock grazing (i.e., temporary non-use)
- Temporary Non Renewable Grazing Authorizations (43 CFR 4130.6-2(a) and 4110.3-1(a)(1))
- Constructing a temporary electric fence to control livestock distribution patterns
- Constructing a permanent fence to control livestock distribution patterns
- Installing temporary water placements (water hauls) to control distribution patterns
- Constructing livestock water developments
- Removing or restricting access to water developments
- Implementing deferred grazing system for appropriate number of pastures
- Splitting or combining pastures based on resource issues
- Implementing a rest-rotation grazing system for the appropriate number of pastures
- Adjusting utilization{ XE "Utilization" } of existing pastures within permitted AUMs
- Using reserve common allotments{ XE "Reserve Common Allotment" }
- Planting species appropriate for the site type to improve rangeland health{ XE "Rangeland Health" }

- Implementing non-structural range improvement{ XE "Range Improvement" } restoration

GSENM and NPS range staff, in coordination with grazing permit{ XE "Permit, Grazing" } holders and the interested public at times, have used one or a combination of these tools to address resource issues documented through the rangeland health{ XE "Rangeland Health" } process. This is typically accomplished through meetings, site visits, and discussion of issues and solutions and results in a plan of action addressing the resource issue and its causal factor{ XE "Causal Factor" }.

Monitoring informs resource managers if changes are successful in making progress toward achieving standards or if another change must be made.

NPS Management Policies for Vegetation
Use only native species in Glen Canyon (NPS 2006, 4.4.4). Utilize native seeds or seedlings of local genetic stock whenever possible.

In Glen Canyon, nonnative species will not be used for restoration purposes (NPS 2006, 4.4.4.1). Vegetation management, including use of nonnative species, will be in accordance with NPS management policies. Restoration is done on a case-by-case basis and is only for ecological health associated with the values and purposes of Glen Canyon.

Management-ignited fires will generally not be allowed in the park except for special circumstances, such as to control potentially new invasive exotic species{ XE "Exotic Species" }. Fire management will follow all applicable NPS laws and regulations, policies, and fire management plans (NPS 2006, 4.5).

2.3 ALLOTMENTS OR AREAS UNAVAILABLE UNDER ALL ACTION ALTERNATIVES

With respect to livestock grazing, the BLM Land Use Planning Handbook (H-1601-1) directs the BLM to, "Identify lands available or not available for livestock grazing (see 43 CFR 4130.2(a)), considering the following factors: 1) other uses for the land; 2) terrain characteristics; 3) soil, vegetation, and watershed characteristics; 4) the presence of undesirable vegetation, including significant invasive weed infestations; and 5) the presence of other resources that may require special management or protection, such as special status species, special recreation management areas{ XE "Special Recreation Management Area (SRMA)" } (SRMAs), or ACECs{ XE "Area of Critical Environmental Concern (ACEC)" } [Areas of Critical Environmental Concern]." The guidance also states: "If an evaluation of Land Health Standards identifies an allotment or group of allotments where Land Health Standards cannot be achieved under any level or management of livestock use, then decisions identifying those areas as available for livestock grazing need to be revisited."

The outcomes of the above factors vary by alternative. However, the BLM established baseline criteria for some factors whereby allotments or portions of allotments would be unavailable under all action alternatives if the criteria were met. Eleven areas met criteria and are unavailable under all action alternatives, as described below. See **Figure 2-2**, Allotments or Pastures Unavailable under all Action Alternatives, for a map of these areas.

River Pasture (NPS-portion only) of Big Bowns Bench Allotment

The River pasture of the Big Bowns Bench allotment was closed to livestock grazing by a plan amendment in 1999 (BLM 1999). The primary reason for closure was to eliminate resource use conflicts between recreational users and livestock. The Escalante River and its tributary canyons receive very high use from both day and overnight hikers. The canyon bottom areas are primary travel routes and use areas. The closures also benefited riparian and upland vegetation, water quality, and wildlife dependent on available forage. In the years since these closures, recreational use has continued to increase and riparian vegetation has noticeably improved.

For the reasons stated above, making the Glen Canyon-portion of the River pasture available would not contribute to the purposes or objectives of Glen Canyon.

Escalante River Allotment

The Escalante River allotment was closed to livestock grazing by a plan amendment in 1999 (BLM 1999). The primary reason for closure was to eliminate resource use conflicts between recreational users and livestock. The Escalante River and its tributary canyons receive very high use from both day and overnight hikers. The canyon bottom areas are primary travel routes and use areas. The closures also benefited riparian and upland vegetation, water quality, and wildlife dependent on available forage. In the years since these closures, recreational use has continued to increase and riparian vegetation has noticeably improved.

For the reasons stated above, making the Escalante River allotment available would not contribute to the purposes or objectives of Glen Canyon.

Harvey's Fear Allotment

The Harvey's Fear allotment is on a relatively narrow mid bench between the top of Fiftymile Mountain and Lake Powell. It surrounds the southern tip of Fiftymile Mountain. The area is difficult to access due to cliffs both above and below. Limited access, water, and forage make it unsuitable for grazing. The 1980 Kanab/Escalante Grazing EIS (BLM 1980) and subsequent 1981 Paria MFP (BLM 1981a) both recommended continuing the closure. Livestock grazing has not occurred in the area in the past 50 years.

For the reasons stated above, making the Harvey's Fear allotment available would not contribute to the purposes or objectives of Glen Canyon.

Muley Twist Allotment

The Muley Twist area in the far northeast corner of the planning area was closed to livestock grazing per the 1981 Escalante MFP (BLM 1981b) due to management decisions associated with Capitol Reef National Park. There is limited access and no possibilities to fence the allotment to keep cattle from trespassing.

Navajo Bench Allotment

The Navajo Bench allotment is on a relatively narrow mid bench between the top of Fiftymile Mountain and Lake Powell. It surrounds the southern tip of Fiftymile Mountain. The area is extremely difficult to access due to cliffs both above and below. Limited access, water, and forage make it unsuitable for grazing. The 1980 Grazing EIS (BLM 1980) and subsequent 1981

Paria MFP (BLM 1981a) both recommended continuing the closure. There has been limited to no livestock grazing in the area in the past 50 years.

For the reasons stated above, making the Navajo Bench allotment available would not contribute to the purposes or objectives of Glen Canyon.

Unallotted Areas in Glen Canyon

This is a remote mesa top near Dangling Rope that cannot be reached by livestock. It has almost certainly never been grazed. Making this area (1,600 acres) available would not contribute to the purposes or objectives of Glen Canyon.

No Man's Mesa Research Natural Area

The area is currently unallotted and is a research natural area that contains relict plant communities. The area has not been grazed since the 1920s.

Rattlesnake Bench Allotment

The Rattlesnake Bench allotment was closed by decision in the 1981 Escalante MFP (BLM 1981b) due to suitability issues, including access, terrain, limited forage, and lack of water. There are also wildlife concerns.

Dry Rock Creek and Middle Rock Creek Pastures of Rock Creek-Mudholes Allotment

These pastures are inaccessible to livestock due to the presence of Lake Powell. The pastures were closed by the BLM in its 1999 MFP amendment (BLM 1999). For these reasons, making pastures in the Rock Creek-Mudholes allotment available would not contribute to the purposes or objectives of Glen Canyon.

Spencer Bench Allotment

The Spencer Bench allotment is on a relatively narrow mid bench between the top of Fiftymile Mountain and Lake Powell. It surrounds the southern tip of Fiftymile Mountain. The area is extremely difficult to access due to cliffs both above and below. Limited access, water, and forage make it unsuitable for grazing. Bighorn sheep use the area. The 1980 Grazing EIS (BLM 1980) and subsequent 1981 Paria MFP (BLM 1981a) both recommended continuing the closure. There has been limited or no livestock grazing in the area in the past 50 years.

For the reasons stated above, making the Spencer Bench allotment available would not contribute to the purposes or objectives of Glen Canyon.

Lower Calf Creek Falls Pasture of Willow Gulch Allotment

The Lower Calf Creek Falls pasture of the Willow Gulch allotment was closed as a result of the construction of the Calf Creek recreation site and campground in 1964. The trail to the lower falls is used almost daily year-round and often has hundreds of visitors hiking to the falls during high-use periods. This is the highest concentrated recreation use area in the planning area.

2.4 DESCRIPTION OF ALTERNATIVES CONSIDERED FOR DETAILED ANALYSIS

2.4.1 Alternative A—No Action

Alternative A is the No Action Alternative and is a continuation of the current management direction contained in the 2000 GSENM MMP{ XE "Monument Management Plan, Grand Staircase-Escalante National Monument (MMP 2000)" }, the four 1981 BLM MFPs (BLM 1981a, 1981b, 1981c, 1981d), and the 1999 Glen Canyon GzMP{ XE "Grazing Management Plan, Glen Canyon (GzMP 1999)" } (NPS 1999). Existing policy and guidance such as regulations (specifically 43 CFR Part 4100, Grazing Administration), BLM Manuals, and NPS Director's Orders will also be followed.

Livestock grazing would continue at the existing permitted levels. Areas that are currently closed to livestock grazing would remain unavailable to livestock grazing. Areas that are currently unallotted (available for grazing but there is no current permitted grazing use) would remain available for livestock grazing. The three reserve common allotments{ XE "Reserve Common Allotment" } would also remain available for use as needed and when authorized.

For GSENM, land use plan decisions for livestock grazing beginning on page 40 of the MMP{ XE "Monument Management Plan, Grand Staircase-Escalante National Monument (MMP 2000)" } would be retained. For allotments in the planning area, the allocation decisions made in the Escalante, Paria, Vermilion, and Zion MFPs (BLM 1981a, 1981b, 1981c, 1981d) and the 1999 livestock grazing amendment to the MFPs (BLM 1999) would be retained. Grazing on the Glen Canyon portion of the planning area would continue to be governed by its 1999 GzMP{ XE "Grazing Management Plan, Glen Canyon (GzMP 1999)" } (NPS 1999).

Land use plan decisions from the six existing land use plans mentioned above have been reorganized to follow the general format in the BLM Land Use Planning Handbook (H-1601-1). Not all existing land use plan decisions readily fit into the goals, objectives, allowable uses, and management action categories described in the handbook. The interdisciplinary team used some judgment to place existing decisions into the four categories. Where there are any discrepancies, the original plan-level document should be used.

Of the 106,202 AUMs that are currently permitted, 29,245 are suspended{ XE "Suspension" }. The suspension of these AUMs is primarily the result of allotment land health evaluations, changes in allotment management, and allocation adjustments made during the establishment of allotment management plans{ XE "Allotment Management Plan" } or other planning efforts conducted for allotments now administered by GSENM. These suspensions primarily occurred by decisions prior to establishment of GSENM.

During the permit renewal process, BLM regulations allow for active AUMs to be decreased and placed in suspension{ XE "Suspension" } on grazing permits{ XE "Permit, Grazing" }. This would be the case if monitoring data were to indicate that the provisions for land health standards are not being achieved and on completion of the appropriate level of analysis. Conversely, if the provisions of land health standards are being achieved and an appropriate level of analysis indicates additional AUMs are available, suspended AUMs may be reactivated during this same permit renewal process. The EIS for this MMP{ XE "Monument Management Plan, Grand Staircase-Escalante National Monument (MMP 2000)" }-A does not consider suspended AUMs in

the analysis of the action alternatives environmental consequences. This is because the level of analysis used at the land use planning level for allotment level decisions and their reactivation is not reasonably foreseeable. This is demonstrated by the current average actual use of 41,343 AUMs.

2.4.2 Alternative B—No Grazing

This alternative would discontinue livestock grazing in GSENM and Glen Canyon. In addition, livestock grazing would be discontinued in allotments in the Kanab (KFO) and Arizona Strip (ASFO) Field Offices where GSENM has livestock grazing administration responsibility. Permittees would be given two years' notification prior to the cancellation of permits (43 CFR 4110.4-2(b)) and would be provided reasonable compensation for improvements placed or constructed by the permittee (43 CFR 4120.3-6(c)). Vegetation treatments{ XE "Vegetation Treatment" } for the purposes of improving land health, wildlife habitat, or natural communities, reducing weeds, or stabilizing cultural sites may still occur per existing decisions in the MMP{ XE "Monument Management Plan, Grand Staircase-Escalante National Monument (MMP 2000)" } (BLM 2000) and Glen Canyon GMP{ XE "General Management Plan, Glen Canyon (GMP 1979)" } (NPS 1979). Nonstructural range improvements{ XE "Range Improvement" } would not be maintained for livestock forage. Structural range improvements will be evaluated and removed as necessary to meet objectives for natural and cultural resources.

No monitoring of impacts from livestock grazing would be needed. While opportunities for science and research related to active grazing would be lost, there could be research associated with the effects of not grazing. The unavailable lands could act as ecological reference areas for comparable regions outside of GSENM and Glen Canyon.

2.4.3 Alternative C—Reduced Grazing

This alternative emphasizes management that prioritizes native species diversity and ecological processes. Protection of Monument ~~objects and~~ resources and objects identified in the Proclamation and protection of park resources and values{ XE "Resources and Values (Glen Canyon)" } would be a priority. Livestock grazing would be managed to ensure reduced impact on resources. A variety of ungrazed reference areas would be established. Changes in grazing systems (e.g., season of use, intensity, and rotation) would be considered first before implementing nonstructural range improvements{ XE "Range Improvement" }. Areas currently unavailable and unallotted would remain unavailable for livestock grazing. Additional areas are identified as unavailable based on resource concerns (see **Table 2-2**, Rationale for Unavailable Allotments). Monitoring would occur specific to Goals and Objectives found in Alternative C, in addition to requirements for BLM Utah Rangeland Health{ XE "Rangeland Health" } Standards. As under Alternative A, AUMs in a suspended{ XE "Suspension" } use category may be returned to active use during permit renewal, if monitoring demonstrates that the range can support reactivating suspended AUMs.

Under this alternative, the active AUMs would be reduced to below active AUMs under current management (Alternative A). Projected average actual use would also be reduced to below current ~~This alternative would reduce grazing to below~~ average actual use, which is 41,343 AUMs based on a 19-year average (1996-2014). There are several allotments that would be unavailable under this alternative where the permittee currently takes nonuse in most years,

which contributes to an average actual use that is much lower than active use, which is 76,957 AUMs.

Table 2-2
Rationale for Unavailable Allotments

Allotment	Rationale	Allotment or Pasture Unavailable under Alternative*			
		A	C	D	E
Alvey Wash	Soil resources, erosion, cultural resources, ungrazed reference area		✓		
Antone Flat	The allotment is currently unallotted and available for trailing only.{ XE "Trailing Only" } There are cultural resources concerns. The allotment could be used as an ungrazed reference area.	✓	✓		✓
Big Bowns Bench					
River pasture	The pastures were made unavailable in a 1999 amendment to the Escalante MFP for riparian resource concerns, wildlife, and recreation conflict. Ungrazed reference area.	✓	✓	✓ (NPS only)	✓
Horse Canyon, Middle, Seep Side pastures	Cultural resources, ungrazed reference area		✓		
Big Horn (Big Flat North pasture)	Cultural resources, ungrazed reference area		✓		
Circle Cliffs (Gulch and Lampstand pastures)	Recreation conflicts in the Gulch; cultural resources, riparian resource concerns, ungrazed reference area, rangeland health{ XE "Rangeland Health" }		✓		
Cottonwood (Gravely Hills and Paria River pastures)	Riparian/ecological concerns, cultural resources, southwestern willow flycatcher habitat, ungrazed reference area, rangeland health{ XE "Rangeland Health" }		✓		

Table 2-2
Rationale for Unavailable Allotments

Allotment	Rationale	Allotment or Pasture Unavailable under Alternative*			
		A	C	D	E
Deer Creek					
Cottonwood and River pastures	The pastures were made unavailable in a 1999 amendment to the Escalante MFP for riparian resource concerns, a federally threatened plant (Ute ladies' tresses) in the Cottonwood pasture, and recreation conflict. The public also noted health and safety concerns, wildlife, vegetation, and water resources concerns. The pastures could be used as ungrazed reference areas.	✓	✓		✓
Brigham Tea and Wolverine pastures	Wolverine is currently a reserve common allotment.{ XE "Reserve Common Allotment" } Health and safety concerns, wildlife, vegetation, and water resources concerns, recreation conflicts, and cultural resources. The pastures could be used as ungrazed reference areas.		✓		
Dry Hollow	Cultural resources, ungrazed reference area	✓	✓		
Dry Valley (Hackberry Canyon)	Recreation conflicts, Kodachrome bladderpod, ungrazed reference area		✓		
Escalante River	See **Section 2.3**. The allotment could also be used as an ungrazed reference area.	✓	✓	✓	✓
Flag Point	The allotment is currently unallotted, and there are cultural resource concerns. The allotment could be used as an ungrazed reference area.		✓		
Flood Canyon	Cultural resources, ungrazed reference area		✓		
Fortymile Ridge (East pasture)	Cultural resources, ungrazed reference area, rangeland health{ XE "Rangeland Health" }		✓		
Harvey's Fear	See **Section 2.3**. The area could also be used as an ungrazed reference area.	✓	✓	✓	✓
King Bench (King Bench pasture)	Cultural resources, recreation conflicts, ungrazed reference area		✓		
Lake (Navajo Point pasture)	The area has not been grazed since 2001 due to damage by feral livestock. There is currently one		✓		✓

Table 2-2
Rationale for Unavailable Allotments

Allotment	Rationale	Allotment or Pasture Unavailable under Alternative*			
		A	C	D	E
	limited water source, and past damage to water sources from livestock has reduced the reliability of drinking water for recreationists in this area. It is currently an archaeological study area that would serve well as a reference area to study impacts on archaeological resources. There are other significant natural resources, and the spread of fire-prone exotic plant species could threaten old-growth pinyon-juniper stands. Because of the rugged and remote nature and dense pinyon-juniper woodlands, many livestock cannot be found during roundup and remain on the pasture year-round. In the 2006 rangeland health{ XE "Rangeland Health" } determination, the allotment did not meet Standards 2 and 3.				
Last Chance (Summer pasture)	Cultural resources, ungrazed reference area		✓		
Little Bowns Bench	Ungrazed reference area		✓		
Long Neck	The allotment is currently unavailable for livestock grazing. Greater than 50 percent high soil degradation{ XE "Soil Degradation" } susceptibility. The area could be used as an ungrazed reference area.	✓	✓		✓
Lower Hackberry	Recreation conflict in the canyon, cultural resources, ungrazed reference area		✓		
Lower Warm Creek	Inaccessible because of Lake Powell, recreational conflicts along Lake Powell shoreline, ungrazed reference area		✓		
Main Canyon	Ungrazed reference area		✓		
McGath Point	The allotment is currently unavailable for livestock grazing. There are cultural resource concerns. The allotment could be used as an ungrazed reference area.	✓	✓		✓

Table 2-2
Rationale for Unavailable Allotments

Allotment	Rationale	Allotment or Pasture Unavailable under Alternative*			
		A	C	D	E
Mollie's Nipple (portion of Buckskin pasture; Blue Springs{ XE "Spring" } and Jenny Clay Hole pastures)	Cultural resources, public safety concerns, water availability, and recreation conflict in Buckskin Gulch; riparian resources concern, rangeland health{ XE "Rangeland Health" } in Blue Springs{ XE "Spring" } and Jenny Clay pastures. The pastures could be used as ungrazed reference areas. In the 2006 Rangeland Health determination, the allotment did not meet Standards 1, 2, and 3.		✓		
Muley Twist	See **Section 2.3**. The area could be used as an ungrazed reference area.	✓	✓	✓	✓
Navajo Bench	See **Section 2.3**. The allotment could be used as an ungrazed reference area.	✓	✓	✓	✓
No Man's Mesa	The area is a research natural area that contains relict plant communities. The area has not been grazed in recent history. The area could be used as an ungrazed reference area.	✓	✓	✓	✓
Phipps					
River pasture	The allotment was made unavailable in the 1999 Escalante MFP amendment for riparian and wildlife resources and recreation conflicts. There are also cultural resource concerns. The pasture could be used as an ungrazed reference area.	✓	✓		✓
Phipps pasture	The pasture is currently used as a reserve common allotment.{ XE "Reserve Common Allotment" } There are cultural resource concerns. The pasture could be used as an ungrazed reference area.		✓		
Rattlesnake Bench	See **Section 2.3**. The allotment could be used as an ungrazed reference area.	✓	✓	✓	✓

Table 2-2
Rationale for Unavailable Allotments

Allotment	Rationale	Allotment or Pasture Unavailable under Alternative*			
		A	C	D	E
Rock Creek-Mudholes					
Dry Rock Creek and Middle Rock Creek pastures	The allotment was made unavailable in the 1999 Escalante MFP amendment for riparian and wildlife resources and recreation conflicts along the Lake Powell shoreline. The pastures could be used as ungrazed reference areas. In the 2006 Rangeland Health{ XE "Rangeland Health" } determination, the allotment did not meet Standards 2 and 4.	✓	✓	✓	✓
Grand Bench pasture	Cultural and natural resources concerns, long-term damage resulting from feral livestock prior to 2001, reduced water availability because of drought and loss of springs,{ XE "Spring" } ungrazed reference area. In the 2006 Rangeland Health{ XE "Rangeland Health" } determination, the allotment did not meet Standards 2 and 4.		✓		
Mudholes and Rock Creek-Mudholes (State) pastures	Cultural resource concerns, ungrazed reference area. In the 2006 Rangeland Health{ XE "Rangeland Health" } determination, the allotment did not meet Standards 2 and 4.		✓		
Little Valley, Rock Creek pastures	Ungrazed reference area. In the 2006 Rangeland Health{ XE "Rangeland Health" } determination, the allotment did not meet Standards 2 and 4.		✓		
Round Valley	Greater than 50 percent high soil degradation{ XE "Soil Degradation" } susceptibility, ungrazed reference area		✓		

Table 2-2
Rationale for Unavailable Allotments

Allotment	Rationale	Allotment or Pasture Unavailable under Alternative*			
		A	C	D	E
Saltwater Creek	The allotment was made unavailable in the 1999 Escalante MFP amendment for riparian and wildlife resources and recreation conflicts. There are also cultural resource concerns. The allotment could be used as an ungrazed reference area.	✓	✓		✓
Spencer Bench	See **Section 2.3**. The allotment could be used as an ungrazed reference area.	✓	✓	✓	✓
Steep Creek	The allotment was made unavailable in the 1999 Escalante MFP amendment for riparian and wildlife resources and recreation conflicts. There are also cultural resource concerns. The allotment could be used as an ungrazed reference area.	✓	✓		✓
Unallotted areas in Glen Canyon	See **Section 2.3**. The areas could be used as ungrazed reference areas and are inaccessible to livestock.	✓	✓	✓	✓
Upper Cattle (Cedar Wash pasture)	Greater than 50 percent high soil degradation{ XE "Soil Degradation" } susceptibility, ungrazed reference area		✓		
Upper Hackberry (South Jody pasture and Upper Hackberry Canyon)	Recreation conflict in the canyon; riparian resource concerns; GSENM objects; greater than 50 percent high soil degradation{ XE "Soil Degradation" } susceptibility, ungrazed reference area		✓		
Upper Paria (Henderson Canyon, Lower Coal Bench, South, Upper Coal Bench, and Willis Creek pastures and unallotted area)	Cultural resources, riparian/wetlands,{ XE "Wetland" } soils, water resources, greater than 50 percent high soil degradation{ XE "Soil Degradation" } susceptibility, ungrazed reference area, rangeland health{ XE "Rangeland Health" }		✓		
Vermilion (Seaman pasture)	Cultural resources, ungrazed reference area, rangeland health{ XE "Rangeland Health" }		✓		
Willow Gulch (Lower Calf Creek Falls pasture)	See **Section 2.3**. The pasture could be used as an ungrazed reference area.	✓	✓	✓	✓

*Not all allotments are included in this table, only those unavailable under Alternatives A, C, D, or E. All allotments

Table 2-2
Rationale for Unavailable Allotments

Allotment	Rationale	Allotment or Pasture Unavailable under Alternative*			
		A	C	D	E

administered by GSENM would be unavailable in Alternative B, as livestock grazing would be eliminated from the decision area.

2.4.4 Alternative D—Increased Grazing

This alternative is derived from the Utah Escalante Region Grazing Zone (UCA 63J-8-105.8) and similar land use ordinances and county resource management plans in Garfield and Kane Counties (e.g., Kane County Land Use Ordinance Chapter 27, Multiple Functions/Multiple Use Grazing Zone). It includes preserving the history, culture, custom, and values of the family ranching industry while emphasizing an improved landscape to maintain a wide variety of beneficiaries.

The goal is to provide for an optimum level of livestock grazing and attainment of healthy rangelands, drought-resilient landscapes, and multiple beneficiaries. It would actively promote improving land health, including developing and maintaining nonstructural range improvements{ XE "Range Improvement" }, restoring sagebrush/grassland ecosystems, controlling noxious and invasive plants{ XE "Invasive Species" }, and controlling pinyon/juniper where livestock grazing occurs. It would promote maintenance of existing range improvements and would allow for construction of new range improvements, such as water development, fence repairs, fence installation, the use of machinery, and vehicle access for range improvements.

This alternative incorporates innovative, adaptive, livestock management practices and allows for on-site grazing management research. AUMs in a suspended{ XE "Suspension" } use category would be returned to active use during permit renewal; the overall number of AUMs would be increased. In this alternative, GSENM would be used as a laboratory for innovative grazing techniques.

The improvement of rangeland conditions would be expedited, to remain consistent with ordinances and local plans. Some unallotted and unavailable allotments would be made available for livestock grazing.

2.4.5 Alternative E—BLM and NPS Preferred

This alternative emphasizes multiple use and sustained yield through grazing management designed to ensure that BLM Utah Rangeland Health{ XE "Rangeland Health" } Standards are achieved and land health is maintained or improved. Livestock grazing would be managed consistent with the Proclamation in GSENM. Nonstructural range improvements{ XE "Range Improvement" } would be managed for both ecosystem processes and forage production. As under Alternative A, AUMs in a suspended{ XE "Suspension" } use category may be returned to active use during permit renewal if monitoring demonstrates that the range can support reactivating suspended AUMs. The alternative also clarifies certain aspects of existing management decisions for vegetation that are related to livestock grazing. In this alternative, GSENM would be used as a laboratory for innovative grazing techniques.

2.5 Alternatives Considered but Dismissed from Detailed Analysis

CEQ{ XE "Council on Environmental Quality (CEQ)" } regulations require agencies to explore and evaluate “all reasonable alternatives, and for alternatives which are eliminated from detailed study, briefly discuss the reasons for their having been eliminated” (40 CFR 1502.14(a)). This section discusses those alternatives considered but eliminated from detailed analysis.

2.5.1 Freeze Grazing Levels and Grazing Management Alternative

An alternative theme that would freeze grazing levels and grazing systems was suggested during the alternatives theme development workshop with the cooperating agencies. Under this concept, grazing levels would be maintained at either the 1981 grazing levels identified in the 1981 MFPs or at 1996 grazing levels when the Monument was established. The 1981 Kanab/Escalante Grazing Final EIS allocated 68,298 AUMs to livestock initially and 91,444 AUMs upon full implementation of the plan, which was identified as being 24 years later (2005; BLM 1981). These numbers include forage on lands that are outside of the decision area for this MMP{ XE "Monument Management Plan, Grand Staircase-Escalante National Monument (MMP 2000)" }-A/EIS.

In both years, the following allotments or portions of allotments were unavailable (or unallotted) and would remain unavailable for livestock grazing: Antone Flat, Big Bowns Bench (River pasture and a portion of Horse Canyon pasture), Deer Creek (Cottonwood and River pastures), Dry Hollow, Escalante River, Flag Point, Harvey’s Fear, Long Neck, McGath Point, Muley Twist, Navajo Bench, Phipps (River pasture), Rattlesnake Bench, Rock Creek-Mudholes (Dry Rock Creek and Middle Rock Creek pastures), Saltwater Creek, Spencer Bench, Steep Creek, Varney Griffin, and Willow Gulch (Lower Calf Creek Falls pasture).

In addition to maintaining grazing at a certain level, grazing management would remain the same as either in 1981 or 1996. This means that range improvements{ XE "Range Improvement" } that existed at that time would be maintained but improvements created after that time would be removed and no new range improvements could be developed.

This alternative was eliminated from detailed analysis because it would be substantially similar to Alternative A. In addition, the alternative would not reflect the planning criteria{ XE "Planning Criteria" }, since freezing grazing levels does not consider policy changes or new information or policy. It also does not identify guidelines and criteria for future allotment-specific adjustments or allow for the flexibility to adapt to new and emerging issues and opportunities through adaptive management.

Planning criteria{ XE "Planning Criteria" } also state that the BLM and NPS will use “current scientific information, research, technologies, and results of inventory, monitoring, and coordination to inform management strategies” and “the MMP{ XE "Monument Management Plan, Grand Staircase-Escalante National Monument (MMP 2000)" }-A will be based on the principles of adaptive management.” Freezing grazing levels does not take into account current science, research, technologies, or inventorying and monitoring to integrate livestock grazing with other management decisions in the MMP. It also does not allow for adaptive management, as grazing levels would remain constant.

2.5.2 Enhanced Grazing Management Alternative

An enhanced grazing alternative, which set a goal of 146,000 AUMs, was among several proposals brought forward during the alternative theme development workshop with the cooperating agencies. After that meeting, the BLM conducted preliminary analyses to determine whether proposed themes were feasible to analyze in detail. The BLM does not believe the enhanced grazing alternative represents a feasible or reasonable alternative to consider in detail as a part of this land use plan amendment process, because the 146,000-AUM goal exceeds the grazing capacity identified for the planning area. As suggested at the workshop, an enhanced grazing alternative would make all allotments available for grazing and implement vegetation restoration actions, water improvements, seeding{ XE "Seeding" } restoration with improved grass varieties, and other actions as needed to improve land health and forage production.

The level of development and vegetation treatments{ XE "Vegetation Treatment" } needed to more than double forage for livestock is not consistent with BLM policy. The FLPMA{ XE "Federal Land Policy and Management Act (FLPMA)" }, Section 102(a)(7) requires the BLM to manage renewable resources for sustained yields, and the planning area contains ecological communities that have low resistance to, and slow recovery from, disturbance. The existing MMP{ XE "Monument Management Plan, Grand Staircase-Escalante National Monument (MMP 2000)" } states that "management activities will not be allowed to significantly shift the makeup of [the natural range of native plant] associations, disrupt their normal population dynamics, or disrupt the normal progression of those associations" (BLM 2000, p. 22). Extensive vegetation treatments specifically to increase forage would not be consistent with vegetation goals in the existing MMP or BLM policy to conserve and protect objects and other resources.

In addition, wilderness study areas (WSAs) overlay about half of GSENM, and uses and activities in WSAs are guided by BLM Manual 6330. Grazing is a grandfathered use. Grazing uses and facilities may continue in the same manner and degree as prior to the area's designation as a WSA.

Generally, in FLPMA{ XE "Federal Land Policy and Management Act (FLPMA)" } Section 603, WSAs, the BLM will continue to authorize the level of permitted use that was documented on October 21, 1976. There can be no reduction in grazing use levels, due to impacts to wilderness characteristics. Temporary increases in authorizations and new livestock developments may be approved only if they meet the nonimpairment standard or one of the exceptions, such as protecting or enhancing wilderness characteristics.

2.5.3 Conservation Alternative

During scoping, Wild Utah Project submitted an alternative for consideration that they named the Conservation Alternative. The submission was co-signed by several other groups: Western Watersheds Project, Southern Utah Wilderness Alliance, Yellowstone to Uintas Connection, Sierra Club, Grand Canyon Wildlands Council, Wild Earth Guardians, and Center for Biological Diversity. The proposal includes criteria for determining lands capable and suitable for livestock grazing.

The BLM conducted preliminary analyses on the capability criteria and one of the suitability criteria provided by the Wild Utah Project (and signed by others) to determine whether the proposal was significantly different from other alternatives analyzed in detail. After the

preliminary analysis, approximately 543,000 acres (24 percent of the decision area) remained suitable for livestock grazing. This analysis did not consider the remainder of the suitability criteria, which would have evolved during full development of the alternative and further reduced the acres suitable for livestock grazing. At that point it was determined that the alternative would be similar to Alternative B in terms of the acres and forage available for livestock grazing.

Some concepts from the Conservation Alternative are carried forward in or are similar to those in Alternative C, such as a priority on restoring ecosystem health, a high emphasis on research through the establishment of ungrazed reference areas representative of the dominant ecological sites{ XE "Ecological Site" } in the decision area, the use of native species only to restore existing seedings{ XE "Seeding" }, and managing biological soil crusts{ XE "Biological Soil Crust" } for the ecological functions that they provide.

2.5.4 Science and Research-based Alternative

An alternative that focused solely on science and research was proposed during the alternatives theme development workshop with the cooperating agencies. The alternative would implement livestock grazing practices from a scientific perspective and use outcomes to further scientific knowledge. Scientific studies would be developed Monument-wide, as well as in those portions of Glen Canyon where GSENM administers livestock grazing.

This alternative on its own does not meet the purpose and need for the MMP{ XE "Monument Management Plan, Grand Staircase-Escalante National Monument (MMP 2000)" }-A because it does not identify lands as available or unavailable for livestock grazing. All lands would be subject to the research plan for the area.

The MMP{ XE "Monument Management Plan, Grand Staircase-Escalante National Monument (MMP 2000)" } already encourages science and research, as evidenced by the Overall Vision in the MMP (BLM 2000, p. 4-5), management guidance for Science and Research (BLM 2000, p. 44-46), and management guidance for other resources and uses that recognize opportunities for science and research. The BLM also conducts land health assessments and uses the results of these assessments to adjust grazing management or systems where necessary to improve land health.

Other data gathering efforts, such as the AIM{ XE "Assessment, Inventory, and Monitoring (AIM)" } strategy, can also identify areas where changes in management are needed to improve land health or curtail impacts on Monument objects. Full implementation of this alternative may also be speculative. It would require willing researchers and funding as well as permittees willing to graze livestock as prescribed by a research plan.

While the science and research-based alternative is not considered in detail as a stand-alone alternative, all alternatives, including the No Action Alternative (Alternative A), include a science and research component.

2.5.5 The Sustainable Multiple Use Grazing Alternative

During scoping, Grand Canyon Trust, The Wilderness Society, and Great Old Broads for Wilderness provided an alternative for consideration titled "The Sustainable Multiple Use

Grazing Alternative" for detailed analysis and requested that it be analyzed unaltered alongside other alternatives considered. As described, this alternative would allow for continued livestock grazing in the planning area while reducing environmental damage associated with current grazing management. This alternative emphasized the following:

- Management would prioritize native species diversity.
- Livestock grazing would be managed to protect Monument objects.
- Best available science would be used to inform management of grazed and ungrazed areas.
- A diversity of interested publics would be encouraged to engage in management of livestock grazing.
- A diversity of grazing arrangements would be used.
- A number and variety of ungrazed reference areas would be established over time.

During this land use planning effort, the BLM is directed to identify lands as available or unavailable for livestock grazing considering factors such as terrain, soil, vegetation, and watershed characteristics, the presence of other resources that may require special management, and other uses for the land. Once a land use decision is made to identify those lands, they remain available or unavailable for the life of the plan or until an amendment to the plan is made. This alternative sought provisional determinations of allotments being available or unavailable for livestock grazing due to shifting resource conditions. These determinations would have been predicated on comparing grazed areas to ungrazed reference areas. The reference areas would have been determined after this planning effort was finalized. Only areas currently unavailable and unallotted areas would be identified as unavailable under this alternative. So at its core, this alternative would not make land use decisions per BLM land use planning guidance.

Additionally, some of the items included in this alternative are not land use planning decisions, as they are either administrative decisions or site-specific, implementation-level decisions, many of which are made during the permit renewal process. Examples of this include the use of riders for specific numbers of days per week during season of use, requiring signage and locks on gates, annual use plan requirements, and the manner in which public involvement should be implemented. These types of decisions are not within the scope of this planning effort.

This alternative also includes actions for public engagement, including actions that are already required by laws and policies, such as providing public comment opportunities for environmental assessments. Others would diminish a manager's discretion as to how to handle public engagement opportunities. None of the items included are land use planning decisions.

While BLM has decided not to carry this alternative forward for detailed analysis in its unaltered state, many of the goals, objectives, and concepts provided in it form the basis for Alternative C. These include managing livestock grazing to protect Monument objects and to prevent degradation of native species diversity and ecosystem function, utilizing the best science available, establishing ungrazed reference areas representative of the dominant ecological sites{ XE "Ecological Site" } in the decision area, restoring existing seedings{ XE "Seeding" } using only

native species, managing biological soil crusts{ XE "Biological Soil Crust" } for the ecological functions that they provide, and using a diversity of grazing systems.

2.6 Rationale for the Identification of the Preferred Alternative

The proposed alternatives offer a range of discrete strategies for resolving deficiencies in existing management, exploring opportunities for enhanced management, and addressing issues identified through internal assessment and public scoping. Comments submitted by other government agencies, public organizations, state and tribal entities, and interested individuals were given careful consideration. Cooperating agencies reviewed and provided comments at critical intervals during the alternative development process.

The BLM land use planning regulations require the BLM to identify a preferred alternative in the Draft MMP{ XE "Monument Management Plan, Grand Staircase-Escalante National Monument (MMP 2000)" }-A/EIS. Formulated by the BLM planning team, the preferred alternative represents those goals, objectives, and actions determined to be most effective at resolving planning issues{ XE "Planning Issues" } at this stage of the process. While collaboration is critical in developing and evaluating alternatives, the final designation of a preferred alternative remains the exclusive responsibility of the BLM.

2.6.1 Recommendations and Resulting Actions

The BLM Utah State Director recommends Alternative E as the preferred alternative. Alternative E was evaluated after examining the effects analysis for all alternatives. It was determined to represent the best combination of decisions to achieve the goals and policies of the BLM; to respond to the purpose and need; to meet statutory requirements; and to best resolve the issues pertinent to planning. Given that the Proclamation provides the BLM with the discretion to continue livestock grazing in balance with managing objects identified in the Proclamation, Alternative E provides a balance of livestock grazing that recognizes the importance of ranching to the local custom and culture{ XE "Custom and Culture" } with management of Monument objects. Because of constraints imposed by wilderness study areas, which comprise approximately 40 percent of GSENM, existing management in the MMP{ XE "Monument Management Plan, Grand Staircase-Escalante National Monument (MMP 2000)" }, and ecological constraints, Alternative E is reflective of the amount of grazing that could reasonably occur while managing for other resources and uses.

The preferred alternative (Alternative E) consists of components (goals, objectives, and actions) of the other alternatives considered. During public review of this Draft MMP{ XE "Monument Management Plan, Grand Staircase-Escalante National Monument (MMP 2000)" }-A/EIS, the BLM is seeking constructive input on the proposals for managing resources and resource uses. After considering these comments, the BLM will develop a proposed MMP-A to be evaluated in the Final EIS. The proposed MMP-A can be any reasonable combination of objectives and actions from Alternatives A, B, C, D, and E presented in this Draft MMP-A/EIS.

2.7 Detailed Comparison of Alternatives

Table 2-3 is the detailed comparison of alternatives. Each row is a unique goal, objective, allocation, or action, which may or may not vary by alternative. If an alternative says, "Same as Alternative A," for example, the alternative would be the same as the action described for Alternative A. In some cases, cells for two or more alternatives are combined. This also

indicates that the alternatives are the same for that row. Unless otherwise stated, goals, objectives, and actions apply to both GSENM and Glen Canyon.

Several goals, objectives, or actions refer to BLM Utah Rangeland Health{ XE "Rangeland Health" } Standards. For NPS, progress toward meeting BLM Utah Rangeland Health Standards must be statistically significant based on quantitative monitoring methods. Furthermore, per NPS 2006 Management Policies, in addition to being ecologically functional, as required under the BLM Utah Rangeland Health Standards, NPS has a requirement that species be exclusively native.

Commented [kk2]: John Spence: Provide definition for glossary of statistically significant based on quantitative monitoring methods.

Throughout this table, acreages have been rounded to the nearest 100 acres.

This page intentionally left blank.

Table 2 3
Detailed Comparison of Alternatives

Commented [kk3]: CINDY: Keep the header as a separate "table" from the rest of the table Don't want the header to repeat but do want the next row to repeat on each page

	Alternative A	Alternative B	Alternative C	Alternative D	Alternative E
1	Goals				
2	**Goal 1** No similar goal	**Goal 1** Manage livestock grazing to maintain healthy ecosystems, protect biological and cultural resources, and to protect the objects of the Proclamation and the values and purposes of Glen Canyon	**Goal 1** Manage livestock grazing in a manner that conserves, protects, or restores the objects of the Proclamation and the values and purposes of Glen Canyon	**Goal 1** BLM Manage the lands to become as productive as feasible for livestock grazing, with a goal of restoring suspended{ XE "Suspension" } and under utilized AUMs, while maintaining a thriving natural ecological balance and multiple use relationships Preserve the history, culture, custom, and values of the grazing industry within the designation Maximize efficient and responsible preservation, enhancement, and development of grazing practices and affected natural, historical, and cultural activities within the designation NPS No similar goal for NPS Based on the NPS Organic Act and Glen Canyon enabling legislation, Glen Canyon does not manage for increased forage production	**Goal 1** BLM Manage livestock grazing to provide for multiple uses while maintaining healthy ecosystems and protecting biological and cultural resources, and Monument objects consistent with the Proclamation NPS Manage livestock grazing while maintaining healthy ecosystems and protecting biological and cultural resources and the values and purposes of Glen Canyon
3	**Goal 2** Grazing uses within the Monument shall be managed, in keeping with applicable laws and regulations, and with the statewide Standards and Guidelines (MMP,{ XE "Monument Management Plan, Grand Staircase Escalante National Monument (MMP 2000)" } p 40)	**Goal 2** No similar goal	**Goal 2** In GSENM and Glen Canyon manage livestock grazing to meet or make objectively measured progress toward meeting BLM Rangeland Health{ XE "Rangeland Health" } Standards where grazing is a contributing factor { XE "Contributing Factor" }**	**Goal 2** Manage livestock grazing using adaptive management principles to meet or make progress toward meeting BLM Utah Rangeland Health{ XE "Rangeland Health" } Standards where grazing is a causal factor { XE "Causal Factor" }*	**Goal 2** In GSENM and Glen Canyon manage livestock grazing to meet or make progress toward meeting BLM Utah Rangeland Health{ XE "Rangeland Health" } Standards where grazing is a causal factor { XE "Causal Factor" }*
4	**Goal 3** Meet or make progress toward meeting BLM Utah Rangeland Health{ XE "Rangeland Health" } Standard 2 Riparian and wetland{ XE "Wetland" } areas are in proper functioning condition, and stream channel morphology and functions are appropriate to soil type, climate, and landform and BLM Utah Rangeland Health{ XE "Rangeland Health" } Standard 4 The BLM	**Goal 3** Same as Alternative A	**Goal 3** Watersheds are in, or are making significant, measurable progress toward, a resilient physical and biological condition, including their upland, riparian wetland{ XE "Wetland" }, and aquatic components; soil and plant conditions support infiltration, soil moisture storage, and the release of water that are in balance with climate and landform and maintain or improve water quality, water quantity, and timing and duration of flow	**Goal 3** Same as Alternative A	**Goal 3** Same as Alternative A

*There is a distinction between Alternative C (where grazing is a contributing factor{ XE "Contributing Factor" }) and Alternatives D and E (where livestock grazing is a causal factor{ XE "Causal Factor" }) If livestock grazing is a contributing factor, it may be one of several factors for an area not meeting BLM Utah Rangeland Health{ XE "Rangeland Health" } Standards If livestock grazing is the causal factor, the reason for the area not meeting is attr buted to livestock grazing
*For NPS, progress toward meeting BLM Utah Rangeland Health{ XE "Rangeland Health" } Standards must be statistically significant, based on quantitative monitoring methods Furthermore, per NPS 2006 Management Policies, in addition to being ecologically functional, as required under the BLM Utah Rangeland Health Standards, species must be exclusively native, in accordance with NPS requirements

FOIA001:01673151

	Alternative A	Alternative B	Alternative C	Alternative D	Alternative E
	will apply and comply with water quality standards established by the State of Utah (R3 172) and the federal Clean Water and Safe Drinking Water Acts Activities on BLM lands will fully support the designated beneficial uses described in the Utah water quality standards (R3 17 2) for surface and groundwater *				
5	**Goal 4** Meet or make progress toward meeting BLM Utah Rangeland Health{ XE "Rangeland Health" } Standard 3 Desired species, including native, threatened, endangered, and special status species, are maintained at a level appropriate for the site and species involved*	**Goal 4** Same as Alternative A	**Goal 4** *GSENM* GSENM native plant communities are healthy, diverse, and productive, or are making significant, measurable progress toward such conditions *Glen Canyon* See *Glen Canyon Vegetation Objective 1* (Glen Canyon Management Common to All Alternatives) and *Vegetation Actions 1 8 (Glen Canyon Only* section of this matrix)	**Goal 4** Same as Alternative A	**Goal 4** Same as Alternative A
6	**Goal 5** Meet or make progress toward meeting BLM Utah Rangeland Health{ XE "Rangeland Health" } Standard 1 Upland soils exhibit permeability and infiltration rates that sustain or improve site productivity, considering the soil type, climate, and landform and BLM Utah Rangeland Health{ XE "Rangeland Health" } Standard 2 Riparian and wetland{ XE "Wetland" } areas are in proper functioning condition, and stream channel morphology and functions are appropriate to soil type, climate, and landform *	**Goal 5** Same as Alternative A	**Goal 5** GSENM and Glen Canyon ecological processes, including the hydrologic cycle, nutrient cycle, and energy flow, are maintained, or there is significant, measurable progress toward their attainment, in order to support healthy biotic populations and communities	**Goal 5** Same as Alternative A	**Goal 5** Same as Alternative A
7	**Goal 6** Meet or make progress toward meeting BLM Utah Rangeland Health{ XE "Rangeland Health" } Standard 2 Riparian and wetland{ XE "Wetland" } areas are in proper functioning condition, and stream channel morphology and functions are appropriate to soil type, climate, and landform *	**Goal 6** Same as Alternative A	**Goal 6** *GSENM* GSENM riparian and wetland{ XE "Wetland" } areas exhibit, or are making significant, measurable progress toward exhibiting, potential native vegetation diversity, density, age structure composition, and cover Stream channel morphology and functions are appropriate to soil type, climate, and landform *Glen Canyon* See Glen Canyon Vegetation Objective 4 and Actions 6 8 in *Glen Canyon Management Common to All Alternatives*	**Goal 6** Same as Alternative A	**Goal 6** Same as Alternative A

	Alternative A	Alternative B	Alternative C	Alternative D	Alternative E
8	**Goal 7** Meet or make progress toward meeting BLM Utah Rangeland Health{ XE "Rangeland Health" } Standard 1 Upland soils exhibit permeability and infiltration rates that sustain or improve site productivity, considering the soil type, climate, and landform	**Goal 7** Same as Alternative A	**Goal 7** *GSENM* Soils exhibit, or are making significant, measurable progress toward, permeability and infiltration rates that sustain potential site productivity or improve site productivity, considering the soil type, climate, and landform *Glen Canyon* See Soils Objective 2 in *Glen Canyon Management Common to All Alternatives*	**Goal 7** Same as Alternative A	**Goal 7** Same as Alternative A
9	*Objectives*				
10	**Objective** Local plans and decisions may be more detailed than the Utah Standards and Guidelines, but must be in conformance with the Standards and be consistent with the Guidelines (MMP{ XE "Monument Management Plan, Grand Staircase Escalante National Monument (MMP 2000)" }, p 40) Improve the condition on suitable and potentially suitable Federal range that is now in poor condition and achieve an upward trend on range that is in a static or downward trend (Escalante MFP RM 2, similar RM 2 in other MFPs)	**Objective** Discontinue all livestock grazing in the decision area	**Objective** GSENM and Glen Canyon are in compliance with water quality standards established by the State of Utah (R 317 2) and the Federal Clean Water and Safe Drinking Water Acts Activities on BLM Lands will fully support the designated beneficial uses described in the Utah Water Quality standards (R 317 2) for surface and groundwater as indicated by • Water quality parameters, including, but not limited to, nutrient loads, total dissolved solids, chemical constituents, fecal coliform, water temperature and algae, meet standards • Macro invertebrate community diversity and composition meet standards and are within 80 percent of relevant reference stream reaches • Fine sediments do not exceed 80 percent of an equivalent ungrazed reference stream **Objective** *GSENM and Glen Canyon* • Native plant communities reflect approximately 80 percent of the native plant diversity, density, age classes, and productivity of relevant ungrazed reference sites (i e , GSENM or Glen Canyon sites which are of similar potential to support the native diversity and have been ungrazed by domestic livestock for 10 years) • Native plant communities support (at 80 percent of reference sites based on appropriate quantitative measures) Native species reoccupy habitat	**Objective** Meet or make progress toward meeting BLM Utah Rangeland Health{ XE "Rangeland Health" }* Standards where grazing is a causal factor{ XE "Causal Factor" } • In GSENM and Glen Canyon, upland soils exhibit permeability and infiltration rates that sustain or improve productivity, considering the soil type, climate, and landform (Rangeland Health{ XE "Rangeland Health" } Standard 1) • In GSENM and Glen Canyon, riparian and wetland{ XE "Wetland" } areas are in properly functioning condition Stream channel morphology and functions are appropriate to soil type, climate, and landform (Rangeland Health{ XE "Rangeland Health" } Standard 2) • In GSENM and Glen Canyon, desired species, including native, threatened, endangered, and special status species, are maintained at a level appropriate for the site and species involved (Rangeland Health{ XE "Rangeland Health" } Standard 3) • In GSENM and Glen Canyon, apply and comply with water quality standards established by the State of Utah (R 317 2) and the Federal Clean Water and Safe Drinking Water Acts Activities will fully support designated beneficial uses described in the Utah Water Quality Standards for surface and groundwater (Rangeland Health{ XE "Rangeland	**Objective** GSENM Same as Alternative D Glen Canyon Same as Alternative C

	Alternative A	Alternative B	Alternative C	Alternative D	Alternative E
			niches and voids caused by disturbances at 80 percent the rate of reoccupation in recovery reference sites (i e , similarly disturbed sites recently excluded from grazing) based on appropriate quantitative measures	Health" } Standard 4)	
			Objective For both GSENM and Glen Canyon • Streambank vegetation, at 80 percent of reference riparian areas{ XE "Riparian Area" } consists of, or shows an independently measurable trend toward, native species with root masses capable of withstanding high streamflow events; maintains cover adequate to protect stream banks and dissipate streamflow energy associated with high water flows, protect against accelerated erosion, capture sediment, and provide for groundwater recharge • Riparian vegetation reflects, at 80 percent of reference riparian areas{ XE "Riparian Area" }, maintenance of riparian and wetland{ XE "Wetland" } soil moisture characteristics, diverse age structure and composition, high vigor, and large woody debris when site potential allows; and provides food, cover and other habitat needs for dependent animal species • At 80 percent of reference riparian areas{ XE "Riparian Area" }, point bars are revegetating and lateral stream movement is associated with natural sinuosity; channel width, depth, pool frequency, and roughness are appropriate to landscape position • An active floodplain is present		
			Objective For both GSENM and Glen Canyon • Ground cover (including litter) is maintained at 80 percent of a relevant (e g , similar soil, vegetation type, precipitation) ungrazed site in the planning area in order to protect the soil surface from excessive water and		

	Alternative A	Alternative B	Alternative C	Alternative D	Alternative E
			wind erosion, promote infiltration, detain surface flow, retard soil moisture loss by evaporation, and provide appropriate biological soil crust{ XE "Biological Soil Crust" } ecosystem functions (hydrology and nutrient cycling) • Biological soil crusts{ XE "Biological Soil Crust" } (also known as cryptobiotic soils) are protected from trampling and other physical disturbance within at least 60 percent of their predicted available habitat within GSENM and within 80 percent of Glen Canyon predicted available habitat • Indicators of excessive erosion such as rills, soil pedestals, mass wasting, and actively eroding gullies and headcuts are within 80 percent of appropriate, identified reference sites		
11	*Allowable Uses (Allocations)*				
12	Allocate 2,089,200 acres as available for livestock grazing (see Figure 2 3, Alternative A) Allocate AUMs as follows • Active 76,957 • Suspended{ XE "Suspension" } 29,245 • Maximum permitted 106,202 *GSENM* 1,791,200 acres *Glen Canyon* 230,100 acres *KFO* 65,500 acres *ASFO* 2,300 acres Of this total, 14,600 acres are allocated as reserve common allotments{ XE "Reserve Common Allotment" } in GSENM	Allocate 0 acres and 0 AUMs as available for livestock grazing (see Figure 2 4 Alternative B)	Allocate 1,619,800 acres as available for livestock grazing (see Figure 2 5, Alternative C) Allocate AUMs as follows • Active 63,144 • Suspended{ XE "Suspension" } 29,245 • Maximum permitted 92,389 *GSENM* 1,405,700 acres *Glen Canyon* 168,600 acres *KFO* 43,200 acres *ASFO* 2,300 acres Zero acres are allocated to reserve common allotments{ XE "Reserve Common Allotment" }	Allocate 2,135,300 acres as available for livestock grazing (see Figure 2 6, Alternative D) Allocate AUMs as follows • Active 107,995 • Suspended{ XE "Suspension" } 0 • Maximum permitted 107,995 *GSENM* 1,838,900 acres *Glen Canyon* 228,500 acres *KFO* 65,500 acres *ASFO* 2,300 acres Zero acres are allocated to reserve common allotments{ XE "Reserve Common Allotment" } When active AUMs reach 95 percent of permitted AUMs (i e , when active AUMs reach 102,595), reevaluate whether the maximum permitted AUMs may be increased above 107,995 AUMs Increasing permitted AUMs would require a plan amendment and associated NEPA{ XE "National Environmental Policy Act (NEPA)" } analysis	Allocate 2,049,500 acres as available for livestock grazing (see Figure Alternative 2 7, E) Allocate AUMs as follows • Active 76,520 • Suspended{ XE "Suspension" } 29,245 • Maximum permitted 105,765 *GSENM* 1,789,300 acres *Glen Canyon* 218,600 acres *KFO* 50,300 *ASFO* 2,300 Of this total, 19,500 acres are reserve common allotments{ XE "Reserve Common Allotment" } in GSENM and Glen Canyon
13	Allocate 153,000 acres as unavailable for livestock grazing (see Figure 2 3, Alternative A)	Allocate 2,242,300 acres as unavailable for livestock grazing (see Figure 2 4, Alternative B)	Allocate 622,500 acres as unavailable for livestock grazing (see Figure 2 5, Alternative C)	Allocate 107,000 acres as unavailable for livestock grazing (see Figure 2 6, Alternative D)	Allocate 192,700 acres as unavailable for livestock grazing (see Figure 2 7, Alternative E)

	Alternative A	Alternative B	Alternative C	Alternative D	Alternative E
	GSENM 64,400 acres *Glen Canyon* 88,700 acres Of this total, 15,700 acres are allocated as trailing only{ XE "Trailing Only" } in GSENM	*GSENM* 1,855,600 acres *Glen Canyon* 318,800 acres *KFO* 65,500 acres *ASFO* 2,300 acres	*GSENM* 449,900 acres *Glen Canyon* 150,200 acres *KFO* 22,400 acres Of this total, 15,200 acres are allocated as trailing only{ XE "Trailing Only" } in KFO	*GSENM* 16,700 acres *Glen Canyon* 90,300 acres	*GSENM* 66,300 acres *Glen Canyon* 95,300 acres *KFO* 15,300 Of this total, 15,200 acres are allocated as trailing only{ XE "Trailing Only" } in KFO
14	Manage the following areas as unavailable for livestock grazing and maintain as unavailable or cancel grazing permits{ XE "Permit, Grazing" } • Big Bowns Bench (River pasture; Escalante MFP Amendment, p 3) • Deer Creek (Cottonwood and River pastures; Escalante MFP Amendment, p 3) • Dry Hollow (Escalante MFP, Table 1) • Escalante River (Escalante MFP Amendment, p 4) • Harvey's Fear (Paria MFP RM 1 2) • Long Neck (Escalante MFP, Table 1) • McGath Point (Escalante MFP Amendment, p 4) • Muley Twist (Escalante MFP, Table 1) • Navajo Bench (Paria MFP RM 1 2) • Phipps (River pastures; Escalante MFP Amendment, p 3) • Rattlesnake Bench (Escalante MFP, Table 1) • Rock Creek Mudholes (Dry Rock Creek and Middle Rock Creek pastures; Escalante MFP, Table 1) • Saltwater Creek (Escalante MFP Amendment, p 4) • Spencer Bench (Paria MFP RM 1 2) • Steep Creek (Escalante MFP Amendment, p 4) • Willow Gulch (Lower Calf Creek Falls pasture)	All allotments in GSENM and Glen Canyon would be unavailable for livestock grazing	Manage the following areas as unavailable for livestock grazing and cancel grazing permits{ XE "Permit, Grazing" } • Alvey Wash • Antone Flat • Big Bowns Bench • Big Horn (Big Flat North pasture) • Circle Cliffs (Gulch and Lampstand pastures) • Cottonwood (Gravely Hills and Paria River pastures) • Deer Creek • Dry Hollow • Dry Valley (Hackberry Canyon) • Escalante River[7] • Flag Point • Flood Canyon • Fortymile Ridge (East pasture) • Harvey's Fear[7] • King Bench (King Bench pasture) • Lake (Navajo Point pasture) • Last Chance (Summer pasture) • Little Bowns Bench • Long Neck • Lower Hackberry • Lower Warm Creek • Main Canyon • McGath Point • Mollie's Nipple (portion of Buckskin pasture; Blue Springs{ XE "Spring" } and Jenny Clay Hole pastures) • Muley Twist[7] • Navajo Bench[7] • No Man's Mesa[7] • Phipps • Rattlesnake Bench[7] • Rock Creek Mudholes	Manage the fo lowing a lotments as unavailable for livestock grazing and cancel grazing permits{ XE "Permit, Grazing" } • Big Bowns Bench (River pasture NPS only)[7] • Escalante River[7] • Harvey's Fear[7] • Muley Twist[7] • Navajo Bench[7] • No Man's Mesa[7] • Rattlesnake Bench[7] • Rock Creek Mudholes (Dry Rock Creek and Middle Rock Creek pastures)[7] • Spencer Bench[7] • Unallotted areas in Glen Canyon[7] • Willow Gulch (Lower Calf Creek Falls pasture)[7]	Manage the following areas as unavailable for livestock grazing and cancel grazing permits{ XE "Permit, Grazing" } • Antone Flat • Big Bowns Bench (River pasture) • Deer Creek (Cottonwood and River pastures) • Escalante River[7] • Harvey's Fear[7] • Lake (Navajo Point pasture) • Long Neck • McGath Point • Muley Twist[7] • Navajo Bench[7] • No Man's Mesa[7] • Phipps (River pastures) • Rattlesnake Bench[7] • Rock Creek Mudholes (Dry Rock Creek and Middle Rock Creek pastures)[7] • Saltwater Creek • Spencer Bench[7] • Steep Creek • Unallotted areas in Glen Canyon[7] • Willow Gulch (Lower Calf Creek Falls pasture)[7]

[7] Allotment or area unavailable in all action alternatives; see Common to All Action Alternatives

	Alternative A	Alternative B	Alternative C	Alternative D	Alternative E
			• Round Valley • Saltwater Creek • Spencer Bench • Steep Creek • Unallotted areas in Glen Canyon[7] • Upper Cattle (Cedar Wash pasture) • Upper Hackberry (South Jody pasture and Upper Hackberry Canyon) • Upper Paria (Henderson Canyon, Lower Coal Bench, Upper Coal Bench, and Willis Creek pastures, and unallotted areas) • Vermilion (Seaman pasture) • Wi low Gulch (Lower Calf Creek Falls pasture)[7]		
15	Continue the unallotted status on the following allotments by not allocating livestock forage in these areas • Antone Flat; continue to allow trailing (Escalante MFP RM 2 8) • Upper Paria (South pasture) • Flag Point (Vermilion MFP Table 1) • Unallotted areas in Glen Canyon • Varney Griffin	No similar action; the allotments are unavailable for livestock grazing	No similar action; the allotments are unavailable for livestock grazing	Manage the previously unallotted Antone Flat, Upper Paria (South pasture), and Varney Griffin allotments as available for livestock grazing Where required, during the permit renewal process, additional assessments will occur to determine whether AUMs are available	No similar action; the allotments are identified as either available or unavailable for livestock grazing During the permit renewal process, additional assessments will occur to determine whether AUMs are available
16	Protect the relict characteristics of No Man's Mesa (Vermilion MFP RM 3)	No similar action (the area is unavailable for livestock grazing)	Manage No Man's Mesa as unavailable for livestock grazing		
17	No similar action; Dry Hollow allotment is unavailable for livestock grazing	No similar action; Dry Hollow allotment is unavailable for livestock grazing	No similar action; Dry Hollow allotment is unavailable for livestock grazing	Combine the Dry Hollow allotment with the Boulder Creek allotment During the permit renewal process, additional assessments will occur to determine whether AUMs are available	Combine the Dry Hollow allotment with the Boulder Creek allotment Do not allocate additional AUMs above those permitted for the Boulder Creek allotment
18	No similar action; Flag Point is unallotted	No similar action; Flag Point is unavailable for livestock grazing	No similar action; Flag Point is unavailable for livestock grazing	Combine the Flag Point allotment with the White Sage allotment During the permit renewal process, additional assessments would occur to determine whether AUMs are available	Combine the Flag Point allotment with the White Sage allotment Do not allocate additional AUMs above those permitted for the White Sage allotment
19	No similar action; Varney Griffin is unallotted	No similar action; Varney Griffin is unavailable for livestock grazing	Manage the Varney Griffin allotment as available for livestock trailing only { XE "Trailing Only" } During trailing, livestock cannot remain in the allotment overnight	No similar action; Varney Griffin is available for livestock grazing	Manage the Varney Griffin allotment as available for livestock trailing only { XE "Trailing Only" } During trailing, livestock cannot remain in the allotment overnight
20	No similar action	No similar action	Divide the Buckskin Pasture of the Mollies Nipple Allotment to protect the seep and reduce recreation conflicts near the mouth of Buckskin Gulch canyon	No similar action	No similar action
21	No similar action	No similar action	No similar action; the allotment would be unavailable for livestock grazing	No similar action	Develop a pasture use system in the King Bench Allotment so that the Gulch is not grazed after February 28 to reduce livestock/recreation use conflicts

	Alternative A	Alternative B	Alternative C	Alternative D	Alternative E
22	Manage a reserve common allotment{ XE "Reserve Common Allotment" } with the remaining AUMs on Phipps allotment and all available forage on Little Bowns Bench allotment, and the Wolverine pasture (148 AUMs) of the Deer Creek allotment This grass bank would only be used during emergencies or for research purposes Emergencies would include, but would not be limited to, drought, insect outbreaks, fire, or floods Any emergency use would not exceed current authorized use and could occur from October 1 to March 31 (Escalante MFP Amendment, p 4)	No similar action; the allotments or pastures are unavailable for livestock grazing	No similar action; the allotments or pastures are unavailable for livestock grazing, and no reserve common allotments{ XE "Reserve Common Allotment" } would be established	No similar action; the allotments or pastures are available for livestock grazing The allotments or pastures are available as individual allotments or could be combined with other allotments based on the needs of the permittee and management for that allotment	Maintain reserve common allotments{ XE "Reserve Common Allotment" } in the Little Bowns Bench, Deer Creek (Wolverine pasture), and Phipps (Phipps pasture) allotments In Glen Canyon, manage Big Bowns Bench (Middle and Seep Side pastures) as reserve common allotments{ XE "Reserve Common Allotment" } Only permittees and lessees that hold permits in the planning area would be authorized to use reserve common allotments{ XE "Reserve Common Allotment" }
23	No similar action; the southern portion of the Grand Bench pasture (Rock Creek Mudholes allotment) is available for livestock grazing	No similar action; the southern portion of the Grand Bench pasture (Rock Creek Mudholes allotment) is unavailable for livestock grazing	No similar action; the southern portion of the Grand Bench pasture (Rock Creek Mudholes allotment) is unavailable for livestock grazing	In Glen Canyon, use the southern portion of the Grand Bench pasture (Rock Creek Mudholes allotment) as an experimental pasture	No similar action; the southern portion of the Grand Bench pasture (Rock Creek Mudholes allotment) is a reserve common allotment { XE "Reserve Common Allotment" }
24	Allow the use of reserve common allotments{ XE "Reserve Common Allotment" } on a nonrenewable basis under 43 CFR 4130 6 2 for a variety of reasons, including, but not limited to • Facilitate research in grazing methods in GSENM • While pastures and allotments are rested, such as After an emergency After vegetation treatments{ XE "Vegetation Treatment" } (including fuels reduction) To make progress toward meeting BLM Utah Rangeland Health{ XE "Rangeland Health" } Standards Remove decadent vegetation Occasional use to help maintain range improvements{ XE "Range Improvement" }	No similar action; the decision area would be unavailable for livestock grazing	No similar action; there are no reserve common allotments{ XE "Reserve Common Allotment" }	No similar action; there are no reserve common allotments{ XE "Reserve Common Allotment" } under this alternative	Use reserve common allotments{ XE "Reserve Common Allotment" } on a nonrenewable basis under 43 CFR 4130 6 2 for a variety of reasons, including, but not limited to • Facilitate research in grazing methods in GSENM • Offset potential temporary reductions in existing allotments, such as After an emergency After vegetation treatments{ XE "Vegetation Treatment" } To make progress toward meeting BLM Utah Rangeland Health{ XE "Rangeland Health" } Standards *
25	No similar action	No similar action; the decision area would be unavailable for livestock grazing	No similar action; there are no reserve common allotments{ XE "Reserve Common Allotment" }	No similar action; there are no reserve common allotments{ XE "Reserve Common Allotment" }	Prioritize use of reserve common allotments{ XE "Reserve Common Allotment" } based on the following • Permittees whose normally permitted allotments are undergoing nonstructural range improvements{ XE "Range Improvement" } or other vegetation restoration projects

FOIA001:01673151

	Alternative A	Alternative B	Alternative C	Alternative D	Alternative E
					• Permittees whose normally permitted allotments are temporarily unavailable due to wildland fire • Permittees whose normally permitted allotments are being rested to make progress toward meeting BLM Utah Rangeland Health{ XE "Rangeland Health" } Standards* • Maintain plant vigor and range improvements{ XE "Range Improvement" } within the allotment
26	Use of Horse Canyon would be restricted to that part of the trail going onto Big Bowns Bench to the trail leaving Horse Canyon going onto King Bench This area would only be used as a holding pasture to gather livestock at the end of the grazing season (Escalante MFP Amendment, p 4)	No similar action; the area would be unavailable for livestock grazing	No similar action; the surrounding pastures would be unavailable	Same as Alternative A	Same as Alternative A In addition, permittees with adjacent permits may trail and gather for up to a week
27	No similar action; newly acquired lands would be managed similarly to surrounding lands subject to the provisions in 43 CFR 4110 10 1	Allocate any newly acquired lands as unavailable for livestock grazing	Same as Alternative A	*GSENM* Newly acquired lands would be available for livestock grazing *Glen Canyon* Same as Alternative B	*GSENM* Same as Alternative A *Glen Canyon* Same as Alternative B
28	No similar action	Cancel all livestock grazing permits{ XE "Permit, Grazing" }	Cancel livestock grazing permits{ XE "Permit, Grazing" } for allotments with active grazing permits identified as unavailable for livestock grazing	No similar action; allotments unavailable under this alternative are currently unavailable	
29	Comply with BLM policy for voluntary relinquishment (currently Instruction Memorandum No 2013 184; see Diagram 2 1, Voluntary Relinquishment Decision Tree) The Authorized Officer may take one or more of the following actions • Issue a grazing permit{ XE "Permit, Grazing" } to a different applicant • Stock with livestock from another allotment with unmet resource objectives • Combine with an adjacent allotment that has unmet resource objectives • Consider use of the allotment as a reserve common allotment{ XE "Reserve Common Allotment" } (i e , continue livestock grazing but do not recognize an individual with preference to the forage) • Amend or revise the land use plan to allocate forage to uses other than livestock grazing In other words, the land use plan would be amended or	No similar action	In GSENM and Glen Canyon, upon receiving any request for voluntary relinquishment of permitted livestock grazing, the Authorized Officer would re evaluate whether ivestock grazing is in the best interest of achieving management plan goals and consider amending the MMP{ XE "Monument Management Plan, Grand Staircase Escalante National Monument (MMP 2000)" } to allocate forage for a different purpose pursuant to Instruction Memorandum No 2013 184 (or most recent policy); see Figure 2 1, Voluntary Relinquishment Decision Tree When voluntarily relinquished or otherwise retired, grazing preference{ XE "Preference, Grazing" } in GSENM or Glen Canyon allotments or pastures containing any of the following or combinations of the following would be considered and publicly analyzed for classification as unavailable	Same as Alternative A Preference would be for one of the following (see Figure 2 1, Voluntary Relinquishment Decision Tree) • Issue a grazing permit{ XE "Permit, Grazing" } to a different applicant • Stock with livestock from another allotment with unmet resource objectives • Combine with an adjacent allotment that has unmet resource objectives	Same as Alternative A

DRAFT

DOI-2019-10 02176

	Alternative A	Alternative B	Alternative C	Alternative D	Alternative E
	revised to allocate the allotment as unavailable for livestock grazing		• Areas that would serve as valuable reference areas • Vegetation types that are either not represented or are underrepresented in the decision area that are ungrazed • Monument objects or Glen Canyon values and purposes that are not compatible with or are impacted by livestock grazing (e g , biological soil crust{ XE "Biological Soil Crust" }, riparian areas{ XE "Riparian Area" }, and declining native plant or wildlife species) • Important cultural resources, such as districts, sites, buildings, structures, and objects • Important opportunities to conserve or restore historical, cultural, soil health, biological soil crust{ XE "Biological Soil Crust" }, fish, wildlife, riparian, vegetation, and/or water quality objectives of the MMP{ XE "Monument Management Plan, Grand Staircase Escalante National Monument (MMP 2000)" } and the GzMP{ XE "Grazing Management Plan, Glen Canyon (GzMP 1999)" } • Riparian areas{ XE "Riparian Area" }, springs{ XE "Spring" }, and hanging gardens that have potential to be impacted or are currently impacted by livestock grazing • Moderate to high recreation values that are compromised by livestock grazing • Populations or habitat for threatened or endangered species; candidate or proposed threatened or endangered species; and special status species, or their habitat (e g , Southwest willow flycatcher, sage grouse, desert bighorn sheep, and Mexican spotted owl)		

	Alternative A	Alternative B	Alternative C	Alternative D	Alternative E
30	No allotments will be converted from cows and horses to domestic sheep within at least a nine mile buffer of bighorn sheep habitat, except where topographic features or other barriers prevent physical contact This is in order to prevent the spread of disease from domestic sheep to desert bighorn sheep Other BLM guidelines or policy in regard to domestic and wild stock interactions will also apply (MMP{ XE "Monument Management Plan, Grand Staircase Escalante National Monument (MMP 2000)" } p 42)	No similar action	Limit kind of livestock to cattle and horses only in GSENM and Glen Canyon		
31	*Management Actions*				
32	As allotments are evaluated through monitoring studies, the season of use can be adjusted to fit current conditions and operator needs consistent with other resource objectives (Escalante MFP RM 1 1)	No similar action	In GSENM and Glen Canyon, adaptively manage season of use, duration, distribution, and stocking rate{ XE "Stocking Rate" } (AUMs) of livestock grazing to ensure that goals and objectives are met Additional requirements, such as an indicator for biological soil crust{ XE "Biological Soil Crust" }, are also described in this alternative To ensure that BLM Utah Rangeland Health{ XE "Rangeland Health" } Standards are met, use range improvements{ XE "Range Improvement" }, salting, supplements, or other techniques, except where prohibited in Glen Canyon In GSENM and Glen Canyon, alter the season of use, duration, and recovery periods based on monitoring data	In GSENM and Glen Canyon, adaptively manage season of use, duration, and distribution of livestock grazing to meet or move toward meeting BLM Utah Rangeland Health{ XE "Rangeland Health" } Standards *, before considering changes to stocking rate{ XE "Stocking Rate" } (AUMs) Actions to improve land health include, but are not limited to • Maintain existing developments (structural and nonstructural improvements) • Install new developments (e g, water developments and fences) • Implement nonstructural range improvements{ XE "Range Improvement" } (e g , restore shrub lands, control juniper, and control or eradicate invasive species{ XE "Invasive Species" }; in GSENM only) • Improve livestock distribution through range improvements{ XE "Range Improvement" }, salting, supplements, or other techniques In GSENM and Glen Canyon, alter the season of use, duration, and recovery periods based on monitoring data Allow flexibility in grazing dates on allotments, both turning out and removal of cattle Manage for conditions rather than calendar dates	In GSENM and Glen Canyon, adaptively manage season of use, duration, distribution, and stocking rate{ XE "Stocking Rate" } (AUMs) of livestock grazing to meet or move toward meeting BLM Utah Rangeland Health{ XE "Rangeland Health" } Standards * To ensure that land health standards are met, use range improvements{ XE "Range Improvement" }, salting, supplements, or other techniques, except where prohibited in Glen Canyon In GSENM and Glen Canyon, alter the season of use, duration, and recovery periods based on monitoring data
33	*GSENM* GRAZ 1 (MMP{ XE "Monument Management Plan, Grand Staircase Escalante National Monument (MMP	No similar action	*GSENM* Follow current regulations and policies with respect to livestock grazing Currently, the BLM regulations for	*GSENM* Follow current regulations and policies with respect to livestock grazing Currently, the BLM regulations for	*GSENM* Follow current regulations and policies with respect to livestock grazing Currently, the BLM regulations for

	Alternative A	Alternative B	Alternative C	Alternative D	Alternative E
	2000)" } p 40 43) The following three step process will be followed so that grazing management conforms with the grazing regulations and Utah's Standards and Guidelines In this process, each grazing allotment will be assessed, and new allotment management plans{ XE "Allotment Management Plan" } will be developed, consistent with the BLM wide grazing permit{ XE "Permit, Grazing" } renewal process and the GzMP{ XE "Grazing Management Plan, Glen Canyon (GzMP 1999)" }, where applicable (Note this is not a complete restatement of GRAZ 1) Step 1 Assessment All allotments will be assessed in accordance with the guidelines and guidance issued by BLM Step 2 Determination of Rangeland Health{ XE "Rangeland Health" } and Evaluation of Existing Grazing Management The GSENM shall determine rangeland health for each allotment according to the Utah Standards and Guidelines for Grazing Administration Step 3 Develop Allotment Management Plans The compatibility of grazing with other land uses will be evaluated in allotment management plans{ XE "Allotment Management Plan" }, and the results of the evaluation will be consistent with all applicable legal authorities, including FLPMA,{ XE "Federal Land Policy and Management Act (FLPMA)" } the Taylor Grazing Act,{ XE "Taylor Grazing Act" } the Public Rangelands Improvement Act,{ XE "Public Rangelands Improvements Act" } 43 CFR 4180, Utah Standards and Guidelines, and the National Wildlife Federation v BLM, 140 Interior Board of Lands Appeals 85 (1997)		livestock grazing are at 43 CFR Part 4100 Furthermore, the BLM follows regulations at 43 CFR 4180 for rangeland health{ XE "Rangeland Health" }, as well as the BLM Utah Standards for Rangeland Health and Guidelines for Livestock Grazing Management* During permit renewal, the BLM will consider the following • Change season of use in allotments with known locations of Ute ladies' tresses so that cattle are not present during sensitive seasons Current known locations are in Deer Creek and Henrieville Creek • Authorize access to improvements for maintenance as described in the permit and in accordance with TRAN 15 and TRAN 16 of the MMP{ XE "Monument Management Plan, Grand Staircase Escalante National Monument (MMP 2000)" } • Change grazing systems (e g , season of use, duration, distribution, and stocking rate{ XE "Stocking Rate" }) to reduce conflicts where livestock grazing overlaps with high use and/or high value recreation areas considering the following factors Management zone prescriptions Whether an area is within an SRMA{ XE "Special Recreation Management Area (SRMA)" } and what the management objectives are for the SRMA Whether an area is within a special designation area, including, but not limited to outstanding natural areas, national or state scenic byways or back ways, national historic, scenic, or recreation trails, WSAs, eligible, suitable, or designated wild and scenic river segments, research natural areas, natural environmental areas, or recreation areas/sites Fee permit areas Increasing trends in visitor use	livestock grazing are at 43 CFR Part 4100 Furthermore, the BLM follows regulations at 43 CFR 4180 for rangeland health{ XE "Rangeland Health" }, as well as the BLM Utah Standards for Rangeland Health and Guidelines for Livestock Grazing Management* During permit renewal, the BLM will consider authorizing access to improvements for maintenance as described in the permit and in accordance with TRAN 15 and TRAN 16 of the MMP{ XE "Monument Management Plan, Grand Staircase Escalante National Monument (MMP 2000)" }	livestock grazing are at 43 CFR Part 4100 Furthermore, the BLM follows regulations at 43 CFR 4180 for rangeland health{ XE "Rangeland Health" }, as well as the BLM Utah Standards for Rangeland Health and Guidelines for Livestock Grazing Management* During permit renewal, the BLM will consider the following • Change season of use in allotments with known locations of Ute ladies' tresses so that cattle are not present during sensitive seasons Current known locations are in Deer Creek and Henrieville Creek • Authorize access to improvements for maintenance as described in the permit and in accordance with TRAN 15 and TRAN 16 of the MMP{ XE "Monument Management Plan, Grand Staircase Escalante National Monument (MMP 2000)" } • Change grazing systems (e g , season of use, duration, distribution, and stocking rate{ XE "Stocking Rate" }) to reduce conflicts where livestock grazing overlaps with high use and/or high value recreation areas considering the following factors Management zone prescriptions Whether an area is within an SRMA{ XE "Special Recreation Management Area (SRMA)" } and what the management objectives are for the SRMA Whether an area is within a special designation area, including but not limited to outstanding natural areas, national or state scenic byways or back ways, national historic, scenic, or recreation trails, WSAs, eligible, suitable, or designated wild and scenic river segments, research natural areas, natural environmental areas, or recreation areas/sites Fee permit areas Increasing trends in visitor use
34	GSENM SOIL 1 (MMP{ XE "Monument	No similar action	*GSENM* Same as Alternative A In	*GSENM* Same as Alternative A	*GSENM* Same as Alternative A

	Alternative A	Alternative B	Alternative C	Alternative D	Alternative E
	Management Plan, Grand Staircase Escalante National Monument (MMP 2000)" } p 21) The BLM will apply procedures to protect soils from accelerated or unnatural erosion in any ground disturbing activity, including route maintenance and restoration The effects of activities such as grazing developments, mineral exploration or development, or water developments will be analyzed through the preparation of project specific National Environmental Policy Act{ XE "National Environmental Policy Act (NEPA)" } (NEPA) documents This process will include inventories for affected resources and the identification of mitigation measures SOIL 2 (MMP{ XE "Monument Management Plan, Grand Staircase Escalante National Monument (MMP 2000)" } p 21) Prior to any ground disturbing activity, the potential effects on biological soil crusts{ XE "Biological Soil Crust" } will be considered and steps will be taken to avoid impacts on their function, health, and distribution Long term research toward preservation and restoration of soils will be part of the adaptive management framework described in Chapter 3 [of the MMP]		addition, pastures with more than 50 percent of soils with moderate soil degradation{ XE "Soil Degradation" } susceptibility would be adaptively managed to minimize degradation Reduce grazing impacts to crust and soils with moderate soil degradation susceptibility • Change season of use for grazing as appropriate for biological soil crust{ XE "Biological Soil Crust" } and soil degradation{ XE "Soil Degradation" } susceptibi ity In general, light to moderate stocking in early to mid wet season is recommended on biological soil crust and soils with moderate soil degradation susceptibility Change season of use so that grazing does not occur during times when crusts are most susceptible to damage Sandy soils are most susceptible when wet or moist Clay is most susceptible when dry • When necessary, use exclosures and fencing to protect sites with biological soil crust{ XE "Biological Soil Crust" } or soils with moderate soil degradation{ XE "Soil Degradation" } susceptibility		*Glen Canyon* Same as Alternative C
35	No similar action	No similar action	No similar action	No similar action	Assess biological soil crust{ XE "Biological Soil Crust" } as an indicator of land health, as described in Pe lant et al (2005) If there is more than a moderate departure from reference, adaptively manage season of use, duration, distribution, and stocking rate{ XE "Stocking Rate" } (AUMs) of livestock grazing
36	Livestock salt blocks and other nutritional supplements will be located away from riparian/wetland{ XE "Wetland" } areas or other permanently located, or other natural water sources It is recommended that the locations of these supplements be moved every year (BLM Utah Guidelines for Livestock Grazing Management)	No similar action	Same as Alternative A, plus Avoid placing salts or supplements in areas with high percentage cover of biological soil crust{ XE "Biological Soil Crust" } or soils with high soil degradation{ XE "Soil Degradation" } susceptibility Do not place salt or supplements within 0 25 mile of a water source	Same as Alternative A	Same as Alternative A, plus Avoid placing salts or supplements in areas with high percentage cover of biological soil crust{ XE "Biological Soil Crust" } or soils with high soil degradation{ XE "Soil Degradation" } susceptibility Do not place salt or supplements within 0 25 mile of a water source

	Alternative A	Alternative B	Alternative C	Alternative D	Alternative E
			Do not place salt or supplements within 0 25 mile of developed recreation sites or designated primitive campsites (e g , day use area or trailhead) Do not place salt or supplements within the 10 special management designations identified in the MMP{ XE "Monument Management Plan, Grand Staircase Escalante National Monument (MMP 2000)" } (pp 57 58)		Do not place salt or supplements within 0 25 mile of developed recreation sites or designated primitive campsites (e g , day use area or trailhead)
37	*GSENM* SCI 1 (MMP{ XE "Monument Management Plan, Grand Staircase Escalante National Monument (MMP 2000)" }, p 44) Monument management priorities and budgets will focus on a comprehensive understanding of the resources of the Monument, while assisting in the development of improved and innovative land management, restoration, and rehabilitation practices The natural, physical, and social sciences, including the study of history, will each play an essential role in science and research activities Research projects will have a multi scale and interdisciplinary approach, when possible Recreation and other uses will be managed to complement science and research objectives SCI 2 (MMP{ XE "Monument Management Plan, Grand Staircase Escalante National Monument (MMP 2000)" }, p 45) The first priority for conducting BLM sponsored research will be to study, collect, or record scientific information that is most at risk of being damaged or lost through disturbance or the passage of time Examples of such information are oral histories and ethnologies related to the Monument area The second priority will be to continue gathering baseline data on the biological, physical, cultural, and social sciences in the Monument A third priority wi l be to conduct applied research on the management of natural	No similar action for livestock grazing (follow MMP{ XE "Monument Management Plan, Grand Staircase Escalante National Monument (MMP 2000)" } and GMP{ XE "General Management Plan, Glen Canyon (GMP 1979)" } for other resources)	*GSENM and Glen Canyon* Same as Alternative A, plus Use science and research to gain an understanding of the impacts of livestock grazing, of the potential for movement toward reference conditions if ungrazed, and to distinguish climate impacts from livestock grazing impacts	*GSENM* Same as Alternative A, plus Research innovative grazing techniques to improve livestock grazing management and land health in accordance with science and research objectives and actions described in the MMP{ XE "Monument Management Plan, Grand Staircase Escalante National Monument (MMP 2000)" } *Glen Canyon* Same as Alternative A	*GSENM* Same as Alternative A, plus GSENM will serve as a laboratory to research innovative grazing techniques and a diversity of grazing practices *Glen Canyon* Same as Alternative C

	Alternative A	Alternative B	Alternative C	Alternative D	Alternative E
	systems, including disturbance and recovery strategies SCI 3 (MMP{ XE "Monument Management Plan, Grand Staircase Escalante National Monument (MMP 2000)" }, p 45) The BLM will encourage researchers to incorporate a public outreach/education component into projects Educators and students will have the opportunity to participate in research activities, where appropriate The BLM will involve communities in science and education activities SCI 4 (MMP{ XE "Monument Management Plan, Grand Staircase Escalante National Monument (MMP 2000)" }, p 45) Research sites and visitor centers will emphasize scientific interpretation Results of scientific research and inventory data will be disseminated through interpretive displays, publications, forums, and public exhibition of objects and artifacts SCI 5 (MMP{ XE "Monument Management Plan, Grand Staircase Escalante National Monument (MMP 2000)" }, p 45) The BLM is currently working on an interpretive plan for the Monument Themes for the various visitor contact stations will be identified, as well as appropriate on site and off site interpretation areas and topics SCI 6 (MMP{ XE "Monument Management Plan, Grand Staircase Escalante National Monument (MMP 2000)" }, p 45) The BLM will play a role in developing educational programs for grades kindergarten through 12, emphasizing the area's scientific and cultural resources The BLM will cooperate with colleges and universities in undergraduate and graduate programs, as resources permit Outreach efforts, such as Monument sponsored science publications and field schools, will be incorporated into management programs, to the extent possible In				

FOIA001:01673151

	Alternative A	Alternative B	Alternative C	Alternative D	Alternative E
	addition to normal avenues for research publications, such as scientific journals and symposia proceedings, the BLM will help facilitate the transfer of research information to the public through periodic science forums and Monument sponsored publications SCI 7 (MMP{ XE "Monument Management Plan, Grand Staircase Escalante National Monument (MMP 2000)" }, p 45) Researchers will have to comply with the decisions in this plan; however, some science and research activities may require the use of equipment, surface disturbance, or personnel, which could exceed the management prescriptions outlined for visitors and other users Except where specifically prohibited, such as in relict plant areas and wildlife protected activity centers, the BLM will consider exceptions to the plan prescriptions This would take place during the special use permitting process for extremely high value research opportunities, especially for those opportunities that may not be available elsewhere Research projects focused on protecting resources at risk will also be considered for exceptions to zone prescriptions The GSENM Advisory Committee will be consulted on whether research proposals that require restricted activities warrant the requested exceptions Evaluation will consider whether the proposed research can be permitted in a manner consistent with the protection of Monument resources, and whether the methods proposed are the minimum necessary to achieve the desired research objective SCI 8 (MMP{ XE "Monument Management Plan, Grand Staircase Escalante National Monument (MMP 2000)" }, p 45) All research and related educational activities will require special use permits SCI 9 (MMP{ XE "Monument Management Plan, Grand Staircase Escalante National				

DRAFT

DOI-2019-10 02183

FOIA001:01673151

	Alternative A	Alternative B	Alternative C	Alternative D	Alternative E
	Monument (MMP 2000)" }, p 46) All research will meet Monument data collection standards to be established by the Monument Manager with the advice of the GSENM Advisory Committee Research will provide information that feeds directly into the adaptive management framework *Glen Canyon* Glen Canyon will use science based information to protect park resources and values { XE "Resources and Values (Glen Canyon)" }				
38	No similar action	No similar action	Use lands identified as unavailable for livestock grazing to compare grazed areas to ungrazed areas to measure progress toward meeting or achieving objectives for native plant communities, riparian and wetland{ XE "Wetland" } areas, and soils Grazed areas should be exceeding or moving toward 80 percent of desirable condition in comparable ungrazed areas In GSENM and Glen Canyon, reference areas exist or are established in order to demonstrate potential for objectives to be met, and/or potential rate of change toward meeting objectives Reference areas are established across the decision area that represent the range of ecosystem and plant community types (both riparian and upland), including sites that have received exotic vegetation treatments{ XE "Vegetation Treatment" } A reference area, with the exception of recovery reference areas (see below), consists of a site that has not been grazed or accessible to livestock for at least 10 years • Where local reference areas are preferable but do not exist, designate local areas to attain future reference area status (i e , at least 10 years of non use by livestock) In the interim, use a more distant, reference site that has not been grazed for at least 10 years • Prioritize establishment of larger, landscape scale reference areas	If ungrazed reference areas are established, do not exceed 0 5 percent in any allotment or 0 5 percent within GSENM; size in Glen Canyon will be determined based on best available science Allotments or pastures identified as unavailable for livestock grazing do not count toward the 0 5 percent cap within the Monument	In GSENM and Glen Canyon where local reference areas are preferable but do not exist, designate reference areas Depending on the purpose, reference areas can be of various sizes and would occur in a variety of ecosystem and plant community types (both upland and riparian) Use reference areas in the Colorado Plateau ecoregion{ XE "Ecoregion" } in Capitol Reef National Park, Bryce Canyon National Park, etc to compare grazed areas to ungrazed areas to measure progress toward meeting BLM Utah Rangeland Health{ XE "Rangeland Health" } Standards All reference areas, even offsite reference areas, can be of various sizes in a variety of ecosystem and plant community types (both upland and riparian) The purpose of establishing ungrazed reference areas is to establish a control in order to confirm the factor(s) for not meeting land health standards and distinguish the impacts of climate change from livestock grazing impacts They also serve to measure the degree to which an area is not meeting, moving toward, or meeting BLM Utah Rangeland Health Standards *

FOIA001:01673151

	Alternative A	Alternative B	Alternative C	Alternative D	Alternative E
			whenever feasible, in order to allow for recovery and/or protection of ecosystem functions, a patchwork of habitats, species diversity, and other elements not easily documented within small reference areas • Establish and maintain at least two permanent range cages (at least 16 feet by 16 feet) in each grazed pasture, in representative areas frequently used by livestock • Recovery reference areas are areas where livestock grazing has ceased, but which have not been ungrazed for 10 years Exclosures of various sizes can immediately begin to provide for comparison with sites on which livestock are being adaptively or experimentally managed for recovery toward particular objectives Recovery on the grazed sites (particularly for such physical features as ground cover, sheet erosion, and stream bank protection; or for seed head production) can be compared with the recently ungrazed sites for comparative rates and types of recovery In GSENM and Glen Canyon, objectives generally will be considered to have been met when monitoring documents the indicators are at least 80 percent (e g, soil cover, willow density, native plant species richness) of those in reference areas of the same ecological site{ XE "Ecological Site" } (e g, soil type, precipitation, elevation, slope) Such reference areas may consist of exclosures, ungrazed pastures/allotments, permanent range cages, or ungrazed recovery reference areas Conditions below 80 percent of the reference site(s) are appropriate subjects for problem solving among the BLM, NPS, permittees, and interested public Monitor currently ungrazed reference areas for conditions and changes absent livestock grazing Monitor newly established reference areas (i e, recovery		

DOI-2019-10 02185

	Alternative A	Alternative B	Alternative C	Alternative D	Alternative E
			reference areas where grazing is discontinued) to see how they move toward a reference state Monitor both grazed and ungrazed areas to differentiate climate impacts from livestock grazing impacts		
39	No similar action	No similar action	Each annual use plan will use the best scientific and professional judgment of the BLM and the NPS, as relevant, as to number of authorized days and/or other instructions that will result in meeting or moving toward objectives Outcomes will inform the next year's annual use plan	No similar action	No similar action
40	No similar action	No similar action	In GSENM and Glen Canyon, when grazing occurs during the growing season, ~~at a minimum~~ there will be a minimum ~~six~~ 6 week~~s~~ deferment between the date of when grazing use begins one year and the date of when grazing use begins the following year (for example, Year 1, grazing during the growing season starts on March 1; Year 2, grazing during the growing season starts April 15) Avoid grazing an area at the same time every year If this is not possible in a particular area, the area will be rested every other year (for example, Year 1, grazing during the growing season; Year 2, rest; Year 3, graze during the growing season)	No similar action	No similar action
41	No similar action	No similar action	In GSENM and Glen Canyon where grazing occurs during winter, use rest rotation grazing so that areas are not grazed more than ~~two~~ 2 out of ~~three~~ 3 years	No similar action	No similar action
42	No similar action	No similar action	In GSENM and Glen Canyon, institute light utilization{ XE "Utilization" } (30 percent), both for riparian and upland areas Implement one pasture a year for each allotment until all pastures in each allotment have a light utilization limit In Glen Canyon, upland areas will have 25 percent maximum utilization in spring{ XE "Spring" } For purposes of quantitatively measuring utilization,{ XE "Utilization" } utilization cages must have been in place for two years (rather than one) in order to depict expected production	No similar action	No similar action

	Alternative A	Alternative B	Alternative C	Alternative D	Alternative E
43	Follow current policy (currently IM 2013 094, Resource Management During Drought)	No similar action	In GSENM and Glen Canyon, utilization{ XE "Utilization" } limits of 25 percent will be operative within all pastures during a drought year using the Standardized Precipitation Index of the National Drought Mitigation Center	Same as Alternative A	Same as Alternative A
44	No similar action; the BLM follows direction provided at 43 CFR 4180	No similar action	*Allotment Action Plans* In addition to requirements in 43 CFR 4180 to initiate change in order to meet or make progress toward meeting BLM Utah Rangeland Health{ XE "Rangeland Health" } Standards, when monitoring of indicators shows a GSENM or Glen Canyon allotment or pasture is failing to meet or move toward objectives, action plans w ll be drawn up for meeting or moving toward objectives Unless explicitly experimental, with appropriate controls and monitoring of outcomes assured, action plans must be based on evidence that the proposed activities or management have resulted in movement toward the particular objectives in other settings and must include methods for measuring whether conditions are improving under the action plan If movement toward BLM Utah Rangeland Health{ XE "Rangeland Health" } Standards and objectives is not being observed/measured, adjustments to the action plan will be made	Same as Alternative A	Same as Alternative A
45	No similar action; the BLM follows direction provided at 43 CFR 4180	No similar action	If a land health determination finds that an allotment is not meeting objectives and BLM Utah Rangeland Health{ XE "Rangeland Health" } Standards and livestock grazing is a contributing or causal factor{ XE "Causal Factor" }, livestock grazing would be temporarily suspended{ XE "Suspension" } Once conditions meet objectives and BLM Utah Rangeland Health Standards, livestock grazing may resume after an evaluation is made that the contributing factors{ XE "Contributing Factor" } that caused the allotment to not meet objectives and BLM Utah Rangeland Health Standards have been reduced, and measures are in place to prevent the allotment from moving	Same as Alternative A	Same as Alternative A

	Alternative A	Alternative B	Alternative C	Alternative D	Alternative E
			away from meeting objectives and BLM Utah Rangeland Health Standards		
46	No similar action	No similar action	Riders can be considered for permit terms and conditions as a tool for better livestock distribution	No similar action	No similar action
47	No similar action; the BLM follows the regulations at 43 CFR 4130 4	No similar action	In GSENM and Glen Canyon, a permittee request for multi year non use or partial use will be granted for conservation or protection goals that can be objectively documented and measured A monitoring plan, including relevant indicators, and schedule will be part of the request	Same as Alternative A	Same as Alternative A
48	*GSENM* WDEV 1 (p 55) Water developments can be used as a management tool throughout the Monument for the following purposes better distribution of livestock when deemed to have an overall beneficial effect on Monument resources, including water sources or riparian areas{ XE "Riparian Area" }, or to restore or manage native species or populations They can be done only when a NEPA{ XE "National Environmental Policy Act (NEPA)" } analysis determines this tool to be the best means of achieving the above objectives and only when the water development would not dewater streams or springs { XE "Spring" } Developments wi l not be permitted to increase overall livestock numbers Maintenance of existing development can continue, but may require NEPA analysis and must be consistent with the objectives of this plan	No similar action	*GSENM* Same as Alternative A	*GSENM* Water developments can be used as a management tool throughout the Monument for the following purposes better distribution of livestock when deemed to have an overall beneficial effect on Monument resources, including water sources or riparian areas{ XE "Riparian Area" }, or to restore or manage native species or populations Any new development will be consistent with Utah water laws	*GSENM* Water developments can be used as a management tool throughout the Monument for the following purposes better distribution of livestock when deemed to have an overall beneficial effect on Monument resources, including water sources or riparian areas{ XE "Riparian Area" }, or to restore or manage native species or populations Any new development will be consistent with Utah water laws They can be done only when the water development would not permanently dewater streams or springs { XE "Spring" }
49	*Glen Canyon* All water developments must consider the needs of wildlife and recreation and will not be constructed, maintained, or utilized in such a way as to preclude the access to that source by wildl fe or recreation users (BLM/NPS Interagency Agreement 1993) Water developments will be considered on a case by case basis and wi l not occur in proposed wilderness	*Glen Canyon* No similar action	*Glen Canyon* Same as Alternative A		
50	No similar action, although it is current practice at GSENM to install shut off valves and float valves or overflows	No similar action	In GSENM and Glen Canyon where water developments are necessary for livestock grazing and protection of Monument values, such developments will be fenced and will protect all associated wetland{	Install shut off valves on any new water development Shut off valves allow the water collection system to be shut off when not needed or in order to protect the riparian area{ XE "Riparian Area" }	Install shut off valves on any new water development and consider their installation during routine maintenance of existing water developments Shut off valves allow the water collection system

	Alternative A	Alternative B	Alternative C	Alternative D	Alternative E
			XE "Wetland" }/ riparian resources Shut off valves will ensure that water remains in its natural course/site when it is not needed for livestock operations Use float valves on tanks during the grazing season so that unused water also remains in its natural course/site	from dewatering Install float valves on new troughs to allow unneeded water to remain in the riparian area { XE "Riparian Area" } In situations where float valves are not feasible because of freezing, overflows can be installed to return unused water to the riparian area	to be shut off when not needed or to protect the riparian area{ XE "Riparian Area" } from dewatering In GSENM and Glen Canyon during routine maintenance of existing water developments and on new water developments, install float valves to allow unneeded water to remain in the riparian area { XE "Riparian Area" } In situations where float valves are not feasible, consider overflows to return unused water to the riparian area
51	Follow IM 2016 147 or most current BLM policy for wildlife escape ladders	No similar action	Same as Alternative A In addition, include a stipulation in new grazing permits{ XE "Permit, Grazing" } to install and maintain functional wildlife escape ladders in water developments	Same as Alternative A	Same as Alternative A
52	The overall objective with respect to soil resources within the Monument is as follows • Manage uses to prevent damage to soil resources and to ensure that the health and distribution of fragile biological soil crusts{ XE "Biological Soil Crust" } is maintained or improved • Increase public education and appreciation of soils and biological soil crusts{ XE "Biological Soil Crust" } through interpretation • Facilitate appropriate research to improve understanding and management of soil resources and biological so l crusts{ XE "Biological Soil Crust" } (MMP{ XE "Monument Management Plan, Grand Staircase Escalante National Monument (MMP 2000)" }, p 21) SOIL 2 (MMP{ XE "Monument Management Plan, Grand Staircase Escalante National Monument (MMP 2000)" }, p 21) Prior to any ground disturbing activity, the potential effects on biological soil crusts{ XE "Biological Soil Crust" } will be considered and steps will be taken to avoid impacts on their function, health, and distribution Long term research toward preservation and restoration of soils will be part of the	No similar action	Same as Alternative A In addition, avoid implementing range improvements{ XE "Range Improvement" } (structural and nonstructura) in areas with high percentage cover of biological soil crust{ XE "Biological Soil Crust" }, high biodiversity conservation value (e g, gypsiferous soils), or where removal of biological soil crust will degrade soil, hydrology, or biology ecosystem function	No similar action	Same as Alternative A In addition, avoid implementing structural range improvements{ XE "Range Improvement" } in areas with high percentage cover of biological soil crust,{ XE "Biological Soil Crust" } high biodiversity conservation value (e g, gypsiferous soils), or where removal of biological soil crust will degrade soil, hydrology, or biology ecosystem function

FOIA001:01673151

	Alternative A	Alternative B	Alternative C	Alternative D	Alternative E
	adaptive management framework described in Chapter 3 [of the MMP]				
53	SOIL 1 (MMP{ XE "Monument Management Plan, Grand Staircase Escalante National Monument (MMP 2000)" } p 21) The BLM will apply procedures to protect soils from accelerated or unnatural erosion in any ground disturbing activity, including route maintenance and restoration The effects of activities such as grazing developments, mineral exploration or development, or water developments will be analyzed through the preparation of project specific NEPA{ XE "National Environmental Policy Act (NEPA)" } documents This process will include inventories for affected resources and the identification of mitigation measures	No similar action	Avoid implementing range improvements{ XE "Range Improvement" } (structural and nonstructural) where there are soils with high soil degradation{ XE "Soil Degradation" } susceptibility	Same as Alternative A	Avoid implementing range improvements{ XE "Range Improvement" } (structural and nonstructural) where there are soils with high soil degradation{ XE "Soil Degradation" } susceptibility
54	No similar action	No similar action	Where needed, relocate existing water developments in areas with high potential for biological soil crust{ XE "Biological Soil Crust" } development to areas with low or no potential for biological soil crust development	No similar action	No similar action
55	No similar action	No similar action	The permittee(s), working with BLM and per BLM weed management policies, will maintain areas free of noxious and nonnative invasive plant{ XE "Invasive Species" } species around structural range improvements{ XE "Range Improvement" }	No similar action	No similar action
56	*Structural Range Improvements{ XE "Range Improvement" }*				
57	*GSENM* The need for and extent of range improvements{ XE "Range Improvement" } is considered on a case by case basis and identified during permit renewal in conformance with the MMP{ XE "Monument Management Plan, Grand Staircase Escalante National Monument (MMP 2000)" }	*GSENM* Evaluate livestock management facilities (i e , structural range improvements{ XE "Range Improvement" } for the purpose of livestock) for utility, historical significance, or other purposes within two years of the ROD Remove livestock management facilities that are determined to be unneeded to meet other MMP{ XE "Monument Management Plan, Grand Staircase Escalante National Monument (MMP 2000)" } objectives	*GSENM* The need for and extent of range improvements{ XE "Range Improvement" } is considered on a case by case basis and identified during permit renewal in conformance with the MMP{ XE "Monument Management Plan, Grand Staircase Escalante National Monument (MMP 2000)" } and with the objectives and actions in this alternative	*GSENM* The need for and extent of range improvements{ XE "Range Improvement" } is considered on a case by case basis and identified during permit renewal in conformance with the MMP{ XE "Monument Management Plan, Grand Staircase Escalante National Monument (MMP 2000)" } and with the objectives and actions in this alternative Best practices include cutting of juniper posts or stays by permittees for the improvement or maintenance of structural range improvements (not in Glen Canyon)	*GSENM* The need for and extent of range improvements{ XE "Range Improvement" } is considered on a case by case basis and identified during permit renewal in conformance with the MMP{ XE "Monument Management Plan, Grand Staircase Escalante National Monument (MMP 2000)" } and with the objectives and actions in this alternative
58	*Glen Canyon* New line cabins are not	No similar action	*Glen Canyon* Same as Alternative A	*Glen Canyon* New structural range	*Glen Canyon* Same as Alternative A

	Alternative A	Alternative B	Alternative C	Alternative D	Alternative E
	appropriate in Glen Canyon (BLM/NPS Interagency Agreement 1993)			improvement{ XE "Range Improvement" } (e g, line cabins or water developments) would only be considered outside of proposed wilderness areas on a case by case basis pursuant to a site specific planning and compliance process	
59	FENCE 1 (p 39) Fences may be used in certain circumstances to protect Monument resources, to manage visitor use, and to manage livestock, consistent with the Proclamation They will be designed and constructed in accordance with visual resource management objectives and the Monument Faci ities Master Plan (see the Visual Resource Management section for related decisions)	Same as Alternative A	Same as Alternative A In addition, in GSENM and Glen Canyon fencing may be allowed or required to meet any of the objectives If fencing is necessary, it will be constructed and maintained in accordance with 43 CFR 4120 3 All fences and other annual permit infrastructure must be maintained and functional prior to livestock entry to the allotment for the season	Same as Alternative A In addition, fence aboveground distinct cultural sites Monitor areas of high potential for cultural resources to minimize impacts to surface or subsurface sites Allow fencing, hiker mazes, or other methods to balance livestock grazing and recreation use In Glen Canyon, fencing would only be done in partnership with the NPS and only if it is determined to be the best mitigation	Same as Alternative A
60	No similar action; BLM policy allows for signage to be put on gates	Same as Alternative A	Same as Alternative A In addition, in GSENM and Glen Canyon where needed, place signs on any gate through which the public passes to indicate the current dates of livestock in the unit (e g, allotment, riparian pasture) on either side of the fence Signs should include instructions to keep the gate closed during those times the livestock should be in one of the two adjacent units	Same as Alternative A	Same as Alternative A
61	*Nonstructural Range Improvements{ XE "Range Improvement" }*				
62	*GSENM* RM 3 (p 26) Livestock grazing after native seedings{ XE "Seeding" } are established will be modified to ensure the survival of the native plants The livestock exclusion period required to allow full establishment of seeded native species and recovery of surviving plants after a wildfire may be more than two years Site evaluation will be required to determine when the native seedings should be grazed again and the effectiveness of the current or new grazing system on the persistence of native plants	No similar action; this action is not needed	*GSENM* Livestock grazing after native seeding{ XE "Seeding" } restoration will be modified to ensure the survival of the native plants In post disturbance areas, suspend livestock grazing for at least two growing seasons or until the majority of native plant species in the area have seeded, whichever is longer Site evaluation will be required to determine when the native seedings should be grazed again and the effectiveness of the current or new grazing system for the persistence of native plants	*GSENM* After disturbance, modify livestock grazing practices until seedings{ XE "Seeding" } are established in order to promote the survival of plants Generally, areas will be rested from livestock grazing for two growing seasons or until site objectives are met Site evaluation will be required to determine when objectives for the seedings are met and grazing can be resumed	
63	*GSENM* NAT 5 (p 29) Nonnative plants will not be used to increase forage for livestock and wildlife	No similar action; this action is not needed	*GSENM* Same as Alternative A	*GSENM* In compliance with BLM Manuals 1745, 6330, and 6340 (or current guidance), allow the use of native and nonnative species to optimize land health, forage, and productivity in nonstructural range improvements{ XE "Range	*GSENM* In compliance with BLM Manuals 1745, 6330, and 6340 (or current guidance), nonstructural range improvements{ XE "Range Improvement" } will emphasize and perpetuate the use of native seeds Use of native species will be

	Alternative A	Alternative B	Alternative C	Alternative D	Alternative E
				Improvement" }	a priority for all nonstructural range improvements in GSENM, and every seed mix will contain native species Prioritize the use of native seeds for restoration of nonstructural range improvements{ XE "Range Improvement" } based on availability, adaptation (ecological site{ XE "Ecological Site" } potential), and probability of success Where probability of success or adapted seed availability is low, desirable nonnative seeds may be used as long as they support ecological objectives Re establishment of appropriate species, relative to site potential, should be the principle objective for restoration efforts
64	*GSENM* Follow guidance for Vegetation Restoration Methods in the MMP{ XE "Monument Management Plan, Grand Staircase Escalante National Monument (MMP 2000)" } (RM 1 through RM 7, p 26 27, and NAT 1 through NAT 6, p 28 30) and RM 1 (MMP{ XE "Monument Management Plan, Grand Staircase Escalante National Monument (MMP 2000)" }, p 26) Mechanical methods, including manual pulling and the use of hand tools, such as chainsaws, machetes, and pruners, may be allowed throughout the Monument RM 2 (MMP{ XE "Monument Management Plan, Grand Staircase Escalante National Monument (MMP 2000)" }, p 26) The use of machinery for such activities as roller chopping, chaining, plowing, and disking, may be allowed in all zones, except the Primitive Zone Chaining has been used in the past to remove pinyon and juniper before reseeding with perennial{ XE "Perennial" } grasses Due to the potential for irreversible impacts on other Monument resources, such as archaeological sites and artifacts and paleontological resources{ XE "Paleontological Resource" }, this treatment method will not be used to	*GSENM* Restore existing nonstructural range improvements{ XE "Range Improvement" } consistent with the MMP{ XE "Monument Management Plan, Grand Staircase Escalante National Monument (MMP 2000)" }	*GSENM* Same as Alternative A, plus, in areas available for livestock grazing, restoration (including maintenance) of sites formerly seeded to exotic species{ XE "Exotic Species" } will utilize native species only This includes nonstructural range improvements{ XE "Range Improvement" } within GSENM that were established prior to Monument designation	*GSENM* Same as Alternative A, plus, in areas available for livestock grazing, restore existing nonstructural range improvements{ XE "Range Improvement" } using a mix of native and nonnative seeds	*GSENM* In areas available for livestock grazing, restore existing nonstructural range improvements{ XE "Range Improvement" } using a mix of native and nonnative species In areas unavailable for livestock grazing, follow guidance in the MMP{ XE "Monument Management Plan, Grand Staircase Escalante National Monument (MMP 2000)" } and BLM Manuals 1745, 6330, and 6340 (or current guidance; Alternative A)

	Alternative A	Alternative B	Alternative C	Alternative D	Alternative E
	remove pinyon and juniper It may be allowed to cover rehabilitation seed mixes with soil after wildfires only in the following scenarios • Noxious weeds{ XE "Noxious Weed" } and invasive nonnative species are presenting a significant threat to Monument resources, or a watershed could be damaged if the burned area were not reseeded • It can be demonstrated that Monument resources will not be detrimentally affected, using full archaeological, paleontological, threatened and endangered species, and other resource clearance and consultation • It is determined that seed cover is necessary for the growth of the native species proposed for seeding{ XE "Seeding" } • Other less surface disturbing measures of covering seed are not available or cannot be applied in a timely manner Visual impacts of chaining will also be minimized near routes and other points of concern by covering the native seed mix with harrows or light chains The GSENM Advisory Committee will be consulted, before the use of machinery for treatments is permitted RM 3 (MMP{ XE "Monument Management Plan, Grand Staircase Escalante National Monument (MMP 2000)" }, pp 26 27) Livestock grazing after native seedings{ XE "Seeding" } are established will be modified to ensure the survival of the native plants The livestock exclusion period, required to allow full establishment of seeded native species and recovery of surviving native plants after a wildfire, may be more than two years Site evaluation will be required to determine when the native seedings should be grazed again and the effectiveness of the current or new grazing system on the persistence of native plants RM 4 (MMP{ XE "Monument Management				

DRAFT

FOIA001:01673151

	Alternative A	Alternative B	Alternative C	Alternative D	Alternative E
	Plan, Grand Staircase Escalante National Monument (MMP 2000)" }, p 27) Chemical methods wi l generally be restricted to the control of noxious weed{ XE "Noxious Weed" } species; they are discussed in that section The use of chemicals may also be allowed in conjunction with research projects and must lead to achieving the overall vegetation objectives These activities will be approved, as determined appropriate, through consultation with the GSENM Advisory Committee RM 5 (MMP{ XE "Monument Management Plan, Grand Staircase Escalante National Monument (MMP 2000)" }, p 27) Biological control will be used exclusively on noxious or exotic weed species RM 6 (MMP{ XE "Monument Management Plan, Grand Staircase Escalante National Monument (MMP 2000)" }, p 27) Management ignited fire is the vegetation restoration method most likely to be used in the Monument This method will be used when fire has been documented to historically occur in an area, and where various factors have prevented natural fire cycles from occurring In these circumstances, the BLM may use management ignited fires and will attempt to simulate natural fire intensity and timing Specific objectives for all management ignited fires will be developed before it is used in the Monument All fire activities will be conducted and coordinated with appropriate fire management personnel, as provided for in the Color Country Interagency Fire Management Area annual operating plan RM 7 (MMP{ XE "Monument Management Plan, Grand Staircase Escalante National Monument (MMP 2000)" }, p 27) With all of the methods described above, vegetation monitoring plots will be established to determine the effectiveness of the treatments in achieving management				

	Alternative A	Alternative B	Alternative C	Alternative D	Alternative E
	objectives and to provide baseline data of overall change This monitoring will include species frequency, density, and distribution data and will be part of the overall adaptive management framework described in **Chapter 3** NAT 1 (MMP{ XE "Monument Management Plan, Grand Staircase Escalante National Monument (MMP 2000)" }, p 28) In keeping with the overall vegetation objectives and Executive Order 11312, native plants will be used as a priority for all projects in the Monument NAT 2 (MMP{ XE "Monument Management Plan, Grand Staircase Escalante National Monument (MMP 2000)" }, pp 28 30) Nonnative plants may be used in limited, emergency situations where they may be necessary to protect Monument resources by stabilizing soils and displacing noxious weeds{ XE "Noxious Weed" } This use will be allowed to the extent that it complies with the vegetation objectives, Executive Order 11312, and the Standards for Rangeland Health{ XE "Rangeland Health" } and Guidelines for Grazing Management for BLM Lands in Utah (1997) In these situations, short lived species (nurse crops) will be used and will be combined with native species to facilitate the ultimate establishment of native species NAT 3 (MMP{ XE "Monument Management Plan, Grand Staircase Escalante National Monument (MMP 2000)" }, p 30) All projects proposed in the Monument contain a restoration or revegetation component and a budget for the cost of seeding{ XE "Seeding" } with native species All planning for projects, in all except limited, emergency situations, will call for the use of native species, and the use of nonnative species will not be analyzed as an alternative NAT 4 (MMP{ XE "Monument Management Plan, Grand Staircase				

FOIA001:01673151

	Alternative A	Alternative B	Alternative C	Alternative D	Alternative E
	Escalante National Monument (MMP 2000)" }, p 30) Nonnative plants may be used for restoration related Research, if the use is consistent with and furthers the overall vegetation management objectives, including NAT 2 above, and after consultation with the GSENM Advisory Committee NAT 5 (MMP{ XE "Monument Management Plan, Grand Staircase Escalante National Monument (MMP 2000)" }, p 30) Nonnative plants will not be used to increase forage for livestock and wildlife NAT 6 (MMP{ XE "Monument Management Plan, Grand Staircase Escalante National Monument (MMP 2000)" }, p 30) Monitoring plots will be established in any areas where nonnative plants are used, in order to document changes in vegetation structure and composition; this will be an integral part of the adaptive management framework described in **Chapter 3** Follow guidance for vegetation restoration methods in BLM Manuals 1745, 6330, and 6340 (or current guidance)				
65	*Glen Canyon* Nonstructural range improvements{ XE "Range Improvement" } and land treatments are not appropriate in Glen Canyon (BLM/NPS Interagency Agreement 1993)	*Glen Canyon* Allow land health treatments consistent with applicable law and policy within Glen Canyon	*Glen Canyon* Same as Alternative A	*Glen Canyon* Nonstructural range improvements{ XE "Range Improvement" } would be limited to the restoration of native plant species No existing nonstructural range improvements are within Glen Canyon	*Glen Canyon* Same as Alternative A
66	*GSENM* Same as RM 1, 2, 4, and 6 in Row 64 above Additional policy is provided in BLM Manual 9011, Chemical Pest Control	No similar action for livestock grazing	Same as Alternative A	Creation of new nonstructural range improvements{ XE "Range Improvement" } in GSENM would be allowed, where not otherwise restricted by another designation For the maintenance of existing or creation of new nonstructural range improvements in GSENM, allow the appropriate treatment method for the site, including aerial chemical treatment Not all methods are appropriate for all site types In other words, the constraints of Alternative A do not apply to nonstructural range improvements needed for livestock grazing management Best practices include the following • Aerial application of tebuthiuron (i e , Spike) or other BLM approved herbicides for removal or thinning of sagebrush to increase biodiversity and increase grass/forb production within nonstructural range improvements{ XE "Range Improvement" } (not in Glen Canyon)	

DOI-2019-10 02196

	Alternative A	Alternative B	Alternative C	Alternative D	Alternative E
				• Chemical applications for brush control (e g , rabbit brush; not in Glen Canyon) • Mechanical treatments (e g , chainings, bull hog, harrow, etc) and hand thinning for new nonstructural range improvements{ XE "Range Improvement" } or maintenance/ improvements of existing nonstructural range improvements (not in Glen Canyon) • Mechanical treatments (e g , chainings, bull hog, etc) or fire treatments for control of pinyon and/or juniper encroachments (not in Glen Canyon) • Use of controlled burns for brush, pinyon, and/or juniper control; generally, will not be used in Glen Canyon (see Common to All Alternatives, NPS Management Policies) All methods would be in compliance with BLM Manual 9011, Chemical Pest Control, or current guidance All activities on NPS lands will be in compliance with applicable laws, policies, and the Glen Canyon Integrated Pest Management Plan	
67	*GSENM* Same as RM 2 in Row 64 above	No similar action for livestock grazing	*GSENM* Same as Alternative A	*GSENM (existing nonstructural range improvements{ XE "Range Improvement" } only)* For the maintenance of existing nonstructural range improvements, allow the use of machinery (e g , roller chopping, chaining, plowing, and disking) in all management zones In other words, the constraints of Alternative A do not apply to nonstructural range improvements needed for livestock grazing management	*GSENM (existing nonstructural range improvements{ XE "Range Improvement" } only)* Allow use of machinery (e g , roller chopping, chaining, bull hogging, disking, and plowing) in existing nonstructural range improvements, including in the Primitive Zone Equipment selection will be made with an emphasis on minimizing surface disturbance and detrimental impacts to soils
68	*GSENM* Same as Row 64 above	No similar action for livestock grazing	*GSENM* Same as Alternative A In addition, nonstructural range improvements{ XE "Range Improvement" } on lands available for livestock grazing in GSENM • Restore or support potential native vegetation and ecosystem processes • Address underlying causes of the problematic conditions prompting nonstructural range improvements{ XE "Range Improvement" } When livestock and/or wild ungulate grazing have contributed to the problematic conditions being treated, grazing will be managed to avoid return of the problematic conditions • Utilize native seeds or seedlings only, of local genetic stock whenever possible • Include measurable Desired Outcomes and the methods that will be used to monitor outcomes when compared to outcomes in a portion of the treated area that is not grazed • Use a variety of measures to protect	*GSENM* Same as Alternative A In addition, nonstructural range improvements{ XE "Range Improvement" } in GSENM will • Nonstructural range improvements{ XE "Range Improvement" } will include native seeds and every seed mix will contain native species as availability, cost, and probability of successful establishment are considered • Design and implement nonstructural range improvements{ XE "Range Improvement" } to increase vegetative cover, increase water infiltration, increase soil productivity, and/or reduce soil erosion • Restore and/or maintain nonstructural range improvements{ XE "Range Improvement" } in a timely manner to promote land health and grazing uses • Allow the development, improvement, expansion, or relocation of nonstructural range improvements{ XE "Range Improvement" }	*GSENM* Same as Alternative A In addition, maintain or restore nonstructural range improvements{ XE "Range Improvement" }, including providing forage for livestock

FOIA001:01673151

	Alternative A	Alternative B	Alternative C	Alternative D	Alternative E
			planted and naturally regenerated seedlings from the effects of trampling, browsing, and girdling by livestock and wildlife Such measures will typically include temporary suspension{ XE "Suspension" } of grazing and may include fencing, tubing, netting, and/or animal repellants, except these deterrents will either not be used in Glen Canyon or will be evaluated on a case by case basis • Mimic natural processes to the degree possible, including, but not limited to, succession and use of prescribed fire		
69	*GSENM* NW 1 (MMP{ XE "Monument Management Plan, Grand Staircase Escalante National Monument (MMP 2000)" }, p 27) The BLM will control noxious weeds{ XE "Noxious Weed" } in accordance with national and state policies and directives Control of noxious weeds{ XE "Noxious Weed" } is also a priority to achieve the overall vegetation objectives stated above NW 2 (MMP{ XE "Monument Management Plan, Grand Staircase Escalante National Monument (MMP 2000)" }, p 27) Projects will be designed in conjunction with Kane and Garfield Counties and adjacent US Forest Service and National Park Service staffs With this strategy, the BLM hopes to control noxious weed{ XE "Noxious Weed" } species and prevent introduction of new invasive species{ XE "Invasive Species" } into the Monument and surrounding ecosystems NW 3 (MMP{ XE "Monument Management Plan, Grand Staircase Escalante National Monument (MMP 2000)" }, p 27) An array of methods will be used to control specific noxious weed{ XE "Noxious Weed" } species These methods include the use of chemicals (aerial spraying, hand spraying, and painting), hand cutting, biological control agents, and manual pulling Each of these methods has a place in the control of	Same as Alternative A	Same as Alternative A	*GSENM* In addition to Alternative A, eradicate tamarisk, Russian olive, and State and County designated undesirable species where livestock grazing is adversely impacted	Same as Alternative A

FOIA001:01673151

	Alternative A	Alternative B	Alternative C	Alternative D	Alternative E
	these invasive species{ XE "Invasive Species" } and will be evaluated for effectiveness as eradication projects are designed NW 4 (MMP{ XE "Monument Management Plan, Grand Staircase Escalante National Monument (MMP 2000)" }, p 27) BLM employees or contractors with appropriate cert fication will be responsible for using these chemicals and will take precautions to prevent possible impacts on nontarget plant species NW 5 (MMP{ XE "Monument Management Plan, Grand Staircase Escalante National Monument (MMP 2000)" }, p 27) Aerial chemical applications may be used only in limited circumstances, as follows • Accessibility is so restricted that no other alternative means is available • It can be demonstrated that nontarget sensitive species or other Monument resources will not be detrimentally affected • Noxious weeds{ XE "Noxious Weed" } are presenting a significant threat to Monument resources The GSENM Advisory Committee will be consulted before the aerial application of chemicals is permitted NW 6 (MMP{ XE "Monument Management Plan, Grand Staircase Escalante National Monument (MMP 2000)" }, p 27) The noxious weed{ XE "Noxious Weed" } control program will prioritize target species Priorities for weed control may include invasiveness of the species, extent of invasion, sensitivity of the area being invaded, and accessibi ity Areas with special status species habitat will have a high priority for weed removal Project level environmental assessments or other NEPA{ XE "National Environmental Policy Act (NEPA)" } analysis will be				

	Alternative A	Alternative B	Alternative C	Alternative D	Alternative E
	completed before noxious weed{ XE "Noxious Weed" } removal begins NW 7 (MMP{ XE "Monument Management Plan, Grand Staircase Escalante National Monument (MMP 2000)" }, pp 27 28) In addition to strategies for controlling established noxious weeds{ XE "Noxious Weed" }, it is also imperative to reduce the introduction of noxious weed species, as stated in Executive Order 11312 on invasive species{ XE "Invasive Species" } Cooperative programs established for controlling these species will also help identify potential new invasions before they become established area wide There are two policies that will help to reduce potential noxious weed{ XE "Noxious Weed" } introduction • First, the BLM requires that all hay used on BLM administered lands be certified weed free This is a statewide policy that applies to the Monument, as well as all other BLM administered lands in Utah • Second is the requirement that all machinery that has been used outside the Monument be cleaned before it is used in the Monument This provision generally applies to contract equipment used for such projects as facilities construction and firefighting Both of these provisions will help reduce the introduction and spread of noxious weed{ XE "Noxious Weed" } species in the Monument NW 8 (MMP{ XE "Monument Management Plan, Grand Staircase Escalante National Monument (MMP 2000)" }, p 28) For major removal projects, monitoring plots will be established in key areas to determine the effectiveness of methods and presence of noxious weed{ XE "Noxious Weed" } species All projects will contain restoration or revegetation protocols to minimize noxious weed species recolonizing treated areas Monitoring in these areas will be part of the adaptive management				

FOIA001:01673151

	Alternative A	Alternative B	Alternative C	Alternative D	Alternative E
	framework described in **Chapter 3** Follow other applicable guidance, including that in the Programmatic Weed EA *Glen Canyon* Follow NPS 2006 Management Policies and the Glen Canyon Integrated Pest Management Plan				
70	No similar action; the BLM follows regulations at 43 CFR 4110	No similar action	Same as Alternative A	In GSENM, actively plan, work toward, and return any AUMs that have been suspended{ XE "Suspension" } to active use as range conditions improve	Same as Alternative A
71	*Monitoring*				
72	Follow BLM regulations at 43 CFR 4180, AIM,{ XE "Assessment, Inventory, and Monitoring (AIM)" } and other approved monitoring methods	Same as Alternative A	*Monitoring* Within one year of the ROD, BLM and NPS (when relevant based on the interagency agreement) will determine, with interested public/permittee input, the methods BLM will use to monitor indicators that objectives are being met BLM monitoring will measure • Meeting or moving toward objectives • Effectiveness of treatments at reaching both project desired outcomes and Monument wide or Glen Canyon wide objectives Methods include • Existing long term trend transects within GSENM and Glen Canyon • Interpreting Indicators of Rangeland Health{ XE "Rangeland Health" } points or transects • Proper Functioning Condition assessment points or stream reaches • AIM{ XE "Assessment, Inventory, and Monitoring (AIM)" } points • Long term monitoring plots in Glen Canyon • Any other methods used systematically by the BLM within GSENM or Glen Canyon	Continue to use existing monitoring techniques and implement others as new methods arise Monitoring will focus on land health (Same as Alternative A)	*GSENM* Same as Alternative A *Glen Canyon* Same as Alternative C
73	Follow BLM regulations at 43 CFR Part 4100, CEQ{ XE "Council on Environmental Quality (CEQ)" } guidance for monitoring, BLM guidance for monitoring, and NPS 2006 Management Policies	No similar action	*Independent Monitoring* Upon objective documentation of on ground indications that objectives are not being met, any member of the public can arrange for a meeting with BLM or NPS staff to discuss and propose solutions to the problem(s)	Same as Alternative A	Same as Alternative A

DOI-2019-10 02201

	Alternative A	Alternative B	Alternative C	Alternative D	Alternative E
			A written record of evidence of the problem(s), solutions considered, and commitments by BLM, interested pub ic, and/or permittees will be retained in the file(s) of the relevant allotment(s) Objective, repeatable data gathered independently (e g , use of BLM monitoring methods or methods in Appendix 9 of the 2012 Final Report and Consensus Recommendations of the Collaborative Group on Sustainable Grazing for National Forests in Southern Utah) is required in problem solving meetings All such meetings are open to the permittees and other interested publics		
74	*Glen Canyon Only*				
75	**Vegetation Goal** Maintain naturally diverse plant communities and species populations similar to Potential Natural Community composition (see GzMP,{ XE "Grazing Management Plan, Glen Canyon (GzMP 1999)" } Appendix C) These include a full complement of native species, plant vigor and health, natural structure for wildlife habitat, dynamic changes, reproductive success, and populational genetic and evolutionary responses (GzMP, p 12)	No similar action	**Vegetation Goal** Manage plant communities in accordance with applicable laws and NPS Management Policies Maintain naturally diverse plant communities and species populations similar to Potential Natural Community composition (see GzMP,{ XE "Grazing Management Plan, Glen Canyon (GzMP 1999)" } Appendix C) These include a full complement of native species, plant vigor and health, natural structure for wildlife habitat, dynamic changes, reproductive success, and population level genetic and evolutionary responses	**Vegetation Goal** Manage vegetation in accordance with applicable laws and NPS Management Policies Maintain naturally diverse plant communities and species populations similar to Potential Natural Community composition (see GzMP,{ XE "Grazing Management Plan, Glen Canyon (GzMP 1999)" } Appendix C) These include a full complement of native species, plant vigor and health, natural structure for wildlife habitat, dynamic changes, reproductive success, and population level genetic and evolutionary responses	
76	**Objective 1, Vegetation Actions** The following items are actions that may be taken to attain the desirable targets and accomplish Objective 1 (GzMP{ XE "Grazing Management Plan, Glen Canyon (GzMP 1999)" }, pp 13 15) • Establish maximum utilization{ XE "Utilization" } rates of 45 percent for Indian ricegrass in all key areas in allotments within Glen Canyon, and also for other key species as necessary, until vegetation meets desirable community composition (potential natural community [PNC]) • In allotments or pastures that are grazed in spring{ XE "Spring" }, utilization{ XE "Utilization" } of Indian ricegrass, and other key species will not exceed 25	No similar action	**Objective 1, Vegetation Actions** The following items are actions that may be taken to attain the desirable targets and accomplish Objective 1 • Establish maximum utilization{ XE "Utilization" } rates of 30 percent for forage species in all key areas in allotments within Glen Canyon, and also for other key species as necessary, until vegetation meets desirable community composition (PNC) • In allotments or pastures that are grazed in spring{ XE "Spring" }, ut lization{ XE "Utilization" } of native forage species and other key species will not exceed 25 percent • In non maintenance or other high priority allotments, utilization{ XE	**Objective 1, Vegetation Actions** The following items are actions that may be taken to attain the desirable targets and accomplish Objective 1 • Establish maximum utilization{ XE "Utilization" } rates of 45 percent for forage species in all key areas in allotments within Glen Canyon, and also for other key species as necessary, until vegetation meets desirable community composition (PNC) • In allotments or pastures that are grazed in spring{ XE "Spring" }, utilization{ XE "Utilization" } of forage species and other key species will not exceed 25 percent • In non maintenance or other high priority allotments, utilization{ XE "Utilization" } of forage species and other key species will not exceed 25 percent in spring{ XE "Spring" } • Adjust grazing seasons for Glen Canyon allotments until vegetation meets desirable community composition (PNC and NPS desired future conditions, which may include BLM Utah Rangeland Health{ XE "Rangeland Health" } Standards) • Maintain or increase amounts of desirable plant species and keep low or reduce numbers of undesirable increasing species (PNC; see GzMP{ XE "Grazing Management Plan, Glen Canyon (GzMP 1999)" }, Appendix C; and NPS desired	

	Alternative A	Alternative B	Alternative C	Alternative D	Alternative E
	percent • In non maintenance or other high priority allotments, utilization{ XE "Utilization" } of Indian ricegrass and other key species will not exceed 25 percent in spring{ XE "Spring" } • Adjust grazing seasons for Glen Canyon allotments until vegetation meets desirable community composition (PNC) • Maintain or increase amounts of desirable plant species and keep low or reduce numbers of undesirable increasing species (PNC; see GzMP{ XE "Grazing Management Plan, Glen Canyon (GzMP 1999)" }, Appendix C) • Adjust stocking rates{ XE "Stocking Rate" } or change grazing prescription until key areas meet late seral or potential natural community composition criteria (see GzMP,{ XE "Grazing Management Plan, Glen Canyon (GzMP 1999)" } Appendix C) For specially designated areas (Research and Protected Natural Areas; see Objective 3), conditions must meet potential natural community composition criteria, as set forth above		"Utilization" } of forage species and other key species will not exceed 25 percent in spring{ XE "Spring" } • Adjust grazing seasons for Glen Canyon allotments until vegetation meets desirable community composition (PNC and NPS desired future conditions, which may include BLM Utah Rangeland Health{ XE "Rangeland Health" } Standards) • Maintain or increase amounts of desirable plant species and keep low or reduce numbers of undesirable increasing species (PNC; see GzMP{ XE "Grazing Management Plan, Glen Canyon (GzMP 1999)" }, Appendix C; and NPS desired future conditions which may include BLM Utah Rangeland Health{ XE "Rangeland Health" } Standards) • Adjust stocking rates{ XE "Stocking Rate" } or change grazing prescription until key areas meet late seral or potential natural community composition criteria (see GzMP{ XE "Grazing Management Plan, Glen Canyon (GzMP 1999)" }, Appendix C), including NPS desired future conditions which may include BLM Utah Rangeland Health{ XE "Rangeland Health" } Standards For specially designated areas (Research and Protected Natural Areas; see Objective 3), conditions must meet potential natural community composition criteria, as set forth above	future conditions which may include BLM Utah Rangeland Health{ XE "Rangeland Health" } Standards) • Adjust stocking rates{ XE "Stocking Rate" } or change grazing prescription until key areas meet late seral or potential natural community composition criteria (see GzMP{ XE "Grazing Management Plan, Glen Canyon (GzMP 1999)" }, Appendix C), including NPS desired future conditions which may include BLM Utah Rangeland Health{ XE "Rangeland Health" } Standards For specially designated areas (Research and Protected Natural Areas; see Objective 3), conditions must meet potential natural community composition criteria, as set forth above	
77	**Objective 2, Vegetation Actions** Special status species will not be subject to grazing if studies show that impacts occur (GzMP{ XE "Grazing Management Plan, Glen Canyon (GzMP 1999)" }, p 15) Consult with the US Fish and Wildlife Service through Section 7 compliance procedures	No similar action	**Objective 2, Vegetation Actions** Special status species will not be subject to grazing if studies show that negative impacts occur Consult with the US Fish and Wildlife Service through Section 7 compliance procedures on federally listed and candidate species		
78	**Objective 3, Vegetation Actions** 3 Prepare Experimental Research Area, Protected Natural Area, or Research Natural Area justification report 4 Consult with the BLM on ways to	No similar action	**Objective 3, Vegetation Actions** 3 Prepare Experimental Research Area, Protected Natural Area, or Research Natural Area justification report and necessary compliance 4 Consult with the BLM on ways to exclude livestock from scientifically important areas		

	Alternative A	Alternative B	Alternative C	Alternative D	Alternative E
	exclude livestock from Protected Natural Areas or Research Natural Areas				
79	**Soils Goal** Maintain the evolutionary and ecological processes of the soil ecosystem (GzMP,{ XE "Grazing Management Plan, Glen Canyon (GzMP 1999)" } p 18)	No similar action	**Soils Goal** Maintain the evolutionary and ecological processes of the soil ecosystem to prevent loss of soil resources		
80	**Soils Objective 1** Collect data on rates of soil erosion on various grazed and ungrazed plots, targeting areas showing excessive erosion, such as rills, soil pedestals, or actively eroding gullies (NPS; GzMP{ XE "Grazing Management Plan, Glen Canyon (GzMP 1999)" }, p 18) Use a combination of rangeland monitoring and sedimentation studies to quantify annual losses or gains from selected, established trend and riparian plots Determine values from plots and compare to expected erosion rates developed by the Natural Resources Conservation Service in all sample areas, through the year 2005 Field data may be collected during routine trend plot monitoring or plant utilization{ XE "Utilization" } studies, etc , or incorporated into other studies conducted by other resource disciplines	No similar action	**Soils Objective 1** Collect data on rates of soil erosion on various grazed and ungrazed plots, targeting areas showing excessive erosion, such as rills, soil pedestals, or actively eroding gullies (NPS) Use a combination of grazed lands monitoring and sedimentation studies to quantify annual losses or gains from selected, established grazed and comparable ungrazed upland trend and riparian plots Determine values from plots and compare to expected erosion rates developed by the Natural Resources Conservation Service in all sample areas Field data may be collected during routine trend plot monitoring or plant utilization{ XE "Utilization" } studies, or incorporated into other studies conducted by other resource disciplines Determine through models and field studies areas where biological soil crusts{ XE "Biological Soil Crust" } are important for retention of soil, and develop standards for maintaining functional biological soil crusts	**Soils Objective 1** Collect data on rates of soil erosion on various grazed and ungrazed plots, targeting areas showing excessive erosion, such as rills, soil pedestals, or actively eroding gullies (NPS) Use a combination of rangeland monitoring and sedimentation studies to quantify annual losses or gains from selected, established upland trend and riparian plots Determine values from plots and compare to expected erosion rates developed by the Natural Resources Conservation Service in all sample areas Field data may be collected during routine trend plot monitoring or plant utilization{ XE "Utilization" } studies, etc , or incorporated into other studies conducted by other resource disciplines Determine through models and field studies areas where biological soil crusts{ XE "Biological Soil Crust" } are critical components of ecosystem function, and develop standards for maintaining functional biological soil crusts	
81	**Water Quality Objective 5** Preserve the aesthetic value of natural water Instream flows will be maintained in natural, unaltered condition (NPS; GzMP,{ XE "Grazing Management Plan, Glen Canyon (GzMP 1999)" } p 19)	No similar action	**Water Quality Objective 5** Preserve the aesthetic value of natural water Instream flows will be maintained in natural, unaltered condition and will be used as needed to restore degraded riparian communities (NPS)		
82	**Wildlife Objective 5** Maintain the natural abundance and diversity of insects (GzMP,{ XE "Grazing Management Plan, Glen Canyon (GzMP 1999)" } p 20)	No similar action	**Wildlife Objective 5** Maintain the natural abundance and diversity of invertebrates		
83	**Cultural Resources Goal** Protect and preserve the scientific value and appreciation for the cultural resources and their settings; this extends to both	No similar action	**Cultural Resources Goal** Same as Alternative A		

FOIA001:01673151

	Alternative A	Alternative B	Alternative C	Alternative D	Alternative E
	prehistoric and historic cultural resources, as well as Traditional Cultural Properties (GzMP,{ XE "Grazing Management Plan, Glen Canyon (GzMP 1999)" } p 22)				
84	**Cultural Resources Objectives 1 5** Protect cultural resources from damage or loss due to livestock grazing activities (GzMP{ XE "Grazing Management Plan, Glen Canyon (GzMP 1999)" }, p 22) The following are actions that may be taken to accomplish the objectives • Cultural resources inventory and documentation • Fencing or other management actions taken to prevent or minimize access to livestock • Consultation through Section 106 compliance	No similar action	**Cultural Resources Objectives 1 5** Same as Alternative A		
85	**Cultural Resources Objective 6** Mitigate potential impacts on cultural resources not protected in situ, including curating artifacts and other materials collected during mitigation (GzMP,{ XE **"Grazing Management Plan, Glen Canyon (GzMP 1999)"** } p 23).	No similar action	**Cultural Resources Objective 6** Same as Alternative A		
86	**Cultural Resources Objective 7** Identify and protect American Indian traditional, cultural, or ceremonial sites (GzMP,{ XE "Grazing Management Plan, Glen Canyon (GzMP 1999)" } p 23)	No similar action	**Cultural Resources Objective 7** Same as Alternative A		
87	**Paleontological and Quaternary Objective 2** Paleontological and quaternary resources will be protected in situ whenever possible Removal will occur only when necessary to safeguard resources from impacts that cannot be administratively controlled (NPS/BLM; GzMP,{ XE "Grazing Management Plan, Glen Canyon (GzMP 1999)" } p 24)	No similar action	**Paleontological and Quaternary Objective 2** Paleontological and quaternary resources will be protected in situ whenever possible Removal will occur only when necessary to safeguard resources from impacts that cannot be administratively controlled (NPS/BLM) through fencing or other exclusion methods		

DOI-2019-10 02205

FOIA001:01673151

This page intentionally left blank

DOI-2019-10 02206

2.8 COMPARATIVE SUMMARY OF ENVIRONMENTAL CONSEQUENCES

The purpose of the environmental consequences analysis in this MMP{ XE "Monument Management Plan, Grand Staircase-Escalante National Monument (MMP 2000)" }-A/EIS is to determine the potential for significant impacts of the federal action on the human environment. CEQ{ XE "Council on Environmental Quality (CEQ)" } regulations for implementing NEPA{ XE "National Environmental Policy Act (NEPA)" } states that "human environment" is interpreted comprehensively to include the natural and physical environment and the relationship of people with the environment (40 CFR, Part 1508.14). The "federal action" is the BLM's selection of an MMP-A on which future livestock grazing decisions will be based for GSENM.

Chapter 4, Environmental Consequences, objectively evaluates the likely direct, indirect, and cumulative impacts on the human and natural environment in terms of environmental, social, and economic consequences that are projected to occur from selecting the alternatives. Some types of impacts for resources or resource uses could be confined to decision area lands, whereas some actions may have off-site/indirect impacts on resources or other land jurisdictions (e.g., private or state lands). The impact analysis identifies both enhancing and improving effects on a resource from management actions, as well as those that have the potential to diminish resource values.

This section highlights the meaningful differences in impacts under the alternatives.

Alternative A (No Action) Resource or Resource Use	Alternative B	Alternative C	Alternative D	Alternative E
Livestock Grazing				
Under Alternative A, continuing to manage 2,089,200 acres as available to livestock grazing and 153,000 acres as unavailable to grazing would allow permitted grazing to continue at current levels (approximately 106,202 permitted AUMs, 76,957 of which are active). Average actual use would continue to be approximately 41,343 AUMs. Allowing structural range improvements{ XE "Range	Discontinuing livestock grazing in the decision area would have the greatest impact on livestock grazing of any of the alternatives because there would be no more livestock grazing. All 136 grazing permits{ XE "Permit, Grazing" } would be cancelled (a 100 percent decrease).	Under Alternative C, the BLM would reduce the acres available for grazing (a 22 percent reduction, compared with Alternative A). A maximum of 92,389 AUMs would be permitted (13 percent reduction from Alternative A); 63,144 of those AUMs would be active and 29,245 would be held in suspension{ XE "Suspension" }. The estimated average actual use would be 7,975 fewer AUMs. Reducing permitted AUMs could result	Under Alternative D, the BLM would increase the acres available for grazing (two percent increase, compared with Alternative A). A maximum of 107,955 AUMs would be permitted (two percent increase from Alternative A due to restoring suspended{ XE "Suspension" } AUMs over time). However, the estimated average actual use would be 1,542 more AUMs. Alternative D allows for the	Under Alternative E, the BLM would slightly decrease the acres available for grazing (a two percent reduction, compared with Alternative A). A maximum of 105,540 AUMs would be permitted (one percent reduction, compared with Alternative A); 76,295 of those AUMs would be active and 29,245 would be held in suspension{ XE "Suspension" }. Estimated average actual use would be 1,243 AUMs less than under Alternative A.

Alternative A (No Action)	Alternative B	Alternative C	Alternative D	Alternative E
Improvement" } in GSENM and Glen Canyon and nonstructural range improvements in GSENM will continue to make forage available for livestock. No grazing permits{ XE "Permit, Grazing" } would be cancelled under this alternative.		in impacts on the ability of individual permittees and lessees to maintain operations, with a potential for economic impacts at the individual or community level. Alternative C would emphasize nonstructural range improvements{ XE "Range Improvement" } using native seed, as well as methods that minimize surface-disturbance. This could limit the amount of forage available for livestock if native seeds are not the best based on site type and needs. The number of grazing permits{ XE "Permit, Grazing" } would decrease by 38 percent, as 52 permits would be cancelled.	implementation of additional areas of seedings{ XE "Seeding" } and vegetation treatments{ XE "Vegetation Treatment" } within GSENM. The resulting increase in forage capacity would help facilitate the reactivation of suspended{ XE "Suspension" } AUMs. No grazing permits{ XE "Permit, Grazing" } would be cancelled. Permits could be authorized for previously unallotted or unavailable areas that are now available for livestock grazing.	The impacts from modifying livestock grazing practices following seed restoration would be the same as identified under Alternative A. Alternative E would provide greater flexibility to grazing permit{ XE "Permit, Grazing" }tees than under Alternative A by allowing for the use of native or nonnative seeds (although prioritized with native first) in nonstructural range improvements{ XE "Range Improvement" }. One grazing permit{ XE "Permit, Grazing" } would be cancelled, but permits could be authorized for the previously unavailable allotment that is now available for livestock grazing.
Vegetation				
Rocky Mountain Two-Needle Pinyon-Juniper Woodland, Great Basin and Intermountain Dry Shrubland and Grassland, and Barren NVCS macrogroups would have the greatest acreage available, representing 91, 92, and 82 percent, respectively, of the total acreage of those macrogroups in the decision area. Under Alternative A, 106,202 AUMs would be	Discontinuing livestock grazing in the decision area would greatly reduce impacts on vegetation through passive and active restoration efforts. Only native species would be allowed to be used for restoration in GSENM, which could limit the potential for meeting BLM Utah Land Health Standards compared to Alternative A if native species are unavailable. No	The reduction in acres available for grazing and AUMs, as well as changes in livestock management and the use of large, ungrazed reference areas, would reduce the impact of grazing on vegetation and improve the likelihood for meeting BLM Utah Land Health Standards in GSENM and Glen Canyon and additional NPS rapid assessment	Under Alternative D, the BLM would increase both the acres available for grazing (two percent increase, compared with Alternative A) and AUMs (two percent increase, compared with Alternative A). While there would be more acres available for livestock grazing and also more AUMs permitted than under Alternative A and although Alternative D would	Reductions in the acres available for grazing and AUMs would reduce the impact of grazing on vegetation in areas that would be unavailable to grazing. However, the increase in density of AUMs would increase the impact in areas available to grazing. In areas available to grazing, this could reduce the likelihood for meeting BLM Utah Land

Alternative A (No Action)	Alternative B	Alternative C	Alternative D	Alternative E
allocated for livestock~~, with 27 acres per AUM in active use~~. Nonnative species would not be used to increase forage for livestock in GSENM. This could hinder the ability to meet the BLM Utah Land Health Standards, if nonnative species could be used to stabilize soils in order to establish vegetative communities. No nonstructural range improvements{ XE "Range Improvement" } would be implemented in Glen Canyon, which would limit the potential for meeting BLM Utah Land Health Standards and additional NPS rapid assessment methods in this area.	nonstructural range improvements{ XE "Range Improvement" } would be implemented in Glen Canyon, having impacts as described for Alternative A.	methods in Glen Canyon compared to Alternative A. Great Basin and Intermountain Dry Shrubland, Rocky Mountain Two-Needle Pinyon-Juniper Woodland, and Grassland, and Barren NVCS macrogroups would have the greatest acreage available, representing 79, 65, and 65 percent, respectively, of the total acreage of those macrogroups in the decision area. Impacts from management of nonstructural range improvements{ XE "Range Improvement" } would be similar to those described for Alternative B. Under Alternative C, additional measures would be implemented to prevent nonnative invasive plants{ XE "Invasive Species" } from establishing or spreading. This would increase the likelihood of meeting BLM Utah Land Health Standards in GSENM and Glen Canyon and additional NPS rapid assessment methods in Glen Canyon compared to Alternative A.	emphasize structural and nonstructural range improvements{ XE "Range Improvement" } that would better distribute livestock, the pattern of livestock use is still likely to be similar to current distribution. Therefore, because more livestock would be on the landscape, there is an increased likelihood that grazing would impact vegetation, making it increasingly difficult to meet BLM Utah Rangeland Health{ XE "Rangeland Health" } Standards in GSENM and Glen Canyon and additional NPS desired vegetation standards in Glen Canyon, compared with Alternative A. Rocky Mountain Two-Needle Pinyon-Juniper Woodland, Great Basin and Intermountain Dry Shrubland, and Grassland, and Barren NVCS macrogroups would have the greatest acreage available, representing 97, 92, and 91 percent, respectively, of the total acreage of those macrogroups in the decision area. Despite c~~C~~hanges in livestock management and the use of a variety of vegetation	Health Standards in GSENM and Glen Canyon and additional NPS rapid assessment methods in Glen Canyon compared to Alternative A. Rocky Mountain Two-Needle Pinyon-Juniper Woodland, Great Basin and Intermountain Dry Shrubland, and Grassland, and Barren NVCS macrogroups would have the greatest acreage available, representing 93, 92, and 83 percent, respectively, of the total acreage of those macrogroups in the decision area. In addition, the BLM would increase the acreage managed as a reserve common allotment{ XE "Reserve Common Allotment" }, which would assist in land restoration efforts. Use of ungrazed reference areas would have impacts as described for Alternative C. Other impacts would be similar to those described for Alternative D.

Alternative A (No Action)	Alternative B	Alternative C	Alternative D	Alternative E
			treatment{ XE "Vegetation Treatment" } methods due to the increase in acres available for grazing and AUMs under Alternative D, there is an increased likelihood that grazing would impact vegetation at a rate that would outpace the management to improve vegetation. Thus, it would be increasingly difficult to meet ~~reduce the impact of grazing on vegetation and improve the likelihood for meeting~~ BLM Utah Land Health Standards in GSENM and Glen Canyon and additional NPS rapid assessment methods in Glen Canyon compared to Alternative A. Similarly, the increase in acres available for grazing and active AUMs would likely cause impacts to vegetation that would outpace management that would allow new seedings and the use of n~~N~~ative and nonnative species ~~would be used~~ for nonstructural range improvements{ XE "Range Improvement" } in GSENM. Under this alternative, it would be more difficult to ~~which would help~~ meet the BLM Utah Land Health	

Alternative A (No Action)	Alternative B	Alternative C	Alternative D	Alternative E
			Standards compared to Alternative A. ~~In addition, new seedings{ XE "Seeding" }would be allowed.~~ Impacts in Glen Canyon would be the same as under Alternative A.	
Wildland Fire Management				
Impacts on wildland fire would be the same as those described under section 4.5 Nature and Type of Impacts. As discussed in Chapter 3, the planning area is dominated by Fire Regime Group III, characterized by 35-200 year return intervals and mixed severity fire. Continued livestock grazing would help to control fine fuel levels and aid in the maintenance of the Fire Regime. The area available for grazing is dominated by VCC Ib (945,700 acres including common reserve allotments; 45 percent of area open to grazing). As discussed in Chapter 3, lands in VCC Ib contain vegetation similar to historic conditions. Continued livestock grazing, would help to control fine fuel levels and aid in the maintenance of the VCC class. An additional 737,400 acres (35 percent of area open to grazing) are classified as VCC IIa/IIb, with moderate departure from historic	The discontinuance of livestock grazing in the decision area has the highest potential to impact levels of fine fuels. As discussed under Nature and Type of Impacts, livestock grazing has been shown to reduce fine fuels levels in the short term. In the absence of livestock grazing, fine fuels levels are likely to increase, with potential to contribute to a risk of more frequent fires. Impacts would be greatest in areas previously available to grazing, and areas with other factors associated with increased fire frequency, such as the presence of cheatgrass. The emphasis on passive restoration would allow for the use of natural wildfires to obtain habitat objectives. In the long term, this may contribute to the maintenance of historic fire regimes and vegetative condition classes. However, the lack of prescribed fire as a tool could limit the ability to alter vegetative conditions to	Under Alternative C, reduction in the acres available for grazing (23 percent reduction) and active AUMs (18 percent reduction) would result in the short term site specific increase in fine fuels and potential for increased fire frequency. Although total levels available to grazing are reduced as compared to Alternative A, the percentage with VCC class remains relatively consistent. In addition, in Alternative C in ungrazed reference areas short-term increases in fine fuels and related increase in fire frequency may occur. In the long term, maintaining stringent objectives for vegetation, could improve overall vegetative conditions, and reduce the presence and spread of invasive species, which would assist in the maintenance of VCC in historic conditions and reduce alterations to fire frequency as compared to Alternative A. Under Alternative C, the BLM	Under Alternative D, the BLM would increase both the acres available for grazing (2 percent increase, compared with Alternative A) and active AUMs (40 percent increase, compared with Alternative A).). however, the pattern of livestock use is still likely to be similar to current distribution due to other constraints. As a result, fine fuel levels would remain low, similar to Alternative A, contributing to ability to maintain VCC and fire regime at the landscape level. Impacts from vegetation management in Glen Canyon would be similar to those described for Alternative A. Impacts from managing the season of use would be similar to those for Alternative A, but Alternative D includes additional measures to control of duration, distribution, and stocking rate. Such measures could minimize the impacts of additional grazing and reduce the spread of invasive species,	Under Alternative E, the BLM would reduce the acres available for grazing (1 percent reduction, compared with Alternative A) and active AUMs (1 percent reduction, compared with Alternative A). Impacts of livestock grazing on fine fuels and related fire behavior would be similar to Alternative A. Use of ungrazed reference areas would have impacts as described for Alternative C. Impacts from vegetation management in Glen Canyon would be the similar as those described under Alternative A. The emphasis under this alternative on sustainable yield and improvement in land health, therefore site specific vegetation conditions may be improved in the long term, limiting impacts on fuels and fire behavior as compared to Alterative A. Impacts from managing nonstructural range improvements in GSENM would be the same as those described under Alternative

Alternative A (No Action)	Alternative B	Alternative C	Alternative D	Alternative E
conditions; and 2,300 acres (less than one percent of area open to grazing) are classified as VCC IIIa, with a high level of departure from historic vegetative conditions. In these areas, and at the site-specific level, alteration to vegetative condition may be need to improve conditions lower fire risks. In GSENM, utilization of prescribed fire as a management tool would provide a mechanism to help maintain VCC similar to historic conditions. In Glen Canyon, allowing use of prescribed fires only for special circumstances, such as to control potentially new invasive exotic species, would limit the ability to utilize this management tool to reduce fuels and maintain current VCC and Fire Regimes.	meet objectives.	and NPS would prioritize passive restoration and non-chemical methods to prevent nonnative invasive plants{ XE "Invasive Species" } from becoming established or spreading as discussed under Alternative B. Allowing the use of prescribed fire in GSENM to mimic natural fire occurrences would provide a tool to assist in maintenance of fire regime and VCCcompared to Alternative A.	thereby helping maintain VCC and fire regime. There is an increased likelihood, however, that grazing would impact vegetation at the site specific level. As a result, site specific changes to vegetation class and related fire frequency, size and intensity may occur. A variety of vegetation treatment methods would be allowed. They would aid in the prevention the establishment or spread of State listed noxious species and other nonnative invasive plants, limiting any increases in fire frequency. Impacts from managing nonstructural range improvements would be the same as those described under Alternative A.	D.
Soil Resources				
Impacts on soil (such as sensitive soils and biological soil crusts{ XE "Biological Soil Crust" }) from livestock and livestock management involving surface disturbance, soil mixing, nutrient cycling, compaction, and authorized uses would continue, as described in Section 4.5.3	Impacts on soil from structural and nonstructural range improvements{ XE "Range Improvement" } would occur, as described in Section 4.5.3 Nature and Type of Effects. There would be no livestock grazing under Alternative B;	Impacts on soil (such as sensitive soils and biological soil crusts{ XE "Biological Soil Crust" }) from livestock and livestock management involving surface disturbance, soil mixing, nutrient cycling, compaction, and authorized uses would occur, as described in Section 4.5.3	Impacts on soil (such as sensitive soils and biological soil crusts{ XE "Biological Soil Crust" }) from livestock and livestock management involving surface disturbance, soil mixing, nutrient cycling, compaction, and authorized uses would occur, as described in Section 4.5.3	Impacts on soil (such as sensitive soils and biological soil crusts{ XE "Biological Soil Crust" }) from livestock and livestock management involving surface disturbance, soil mixing, nutrient cycling, compaction, and authorized uses would occur, as described in Section 4.5.3

Alternative A (No Action)	Alternative B	Alternative C	Alternative D	Alternative E
Nature and Type of Effects. There would continue to be 2,089,000 acres (93 percent of the decision area) available for livestock grazing. There are 1,276,000 acres (57 percent of the decision area) where livestock grazing (available for grazing, reserve common allotments{ XE "Reserve Common Allotment" }, and trailing) would continue to occur on sensitive soils (BLM GIS 2014). Impacts on soil from structural and nonstructural range improvements{ XE "Range Improvement" } would continue under current management. In GSENM, the BLM would maintain or restore ranges with native and nonnative species. However, nonstructural range improvements and land treatments are not appropriate in Glen Canyon. There are six livestock grazing allotments in the decision area that do not meet Standard 1, and livestock grazing was determined to be the cause	consequently, there would be no impacts on soil (including sensitive soils, early biological crust, and late biological crust aggregate) from livestock. Alternative B would have the least impacts on soil from livestock. Impacts on soil from structural and nonstructural range improvements{ XE "Range Improvement" } would still occur. In GSENM, the BLM would restore ranges with native species. In GSENM and Glen Canyon, structural range improvements may be removed. There are six livestock grazing allotments in the decision area that do not meet Standard 1, and livestock grazing was determined to be the cause on all six allotments. Because livestock grazing would not occur, these six allotments have a higher potential for meeting Standard 1 more quickly under Alternative B than under Alternative A. Since 2006, the BLM, in coordination with permittees, has made changes in the six allotments, resulting in	Nature and Type of Effects. There would be 1,619,700 acres (72 percent of the decision area) available for livestock grazing. There would be 469,300 fewer acres (21 percent of the decision area) available for livestock grazing than under Alternative A. Compared with Alternative A, there would be fewer impacts on soil, because less area would be grazed. There are 1,010,300 acres (45 percent of the decision area) where livestock grazing and trailing would occur on sensitive soils (BLM GIS 2014). Compared with Alternative A, the area where livestock activities would occur on sensitive soils would decrease by 12 percent of the decision area, thereby providing more protection to these soil types. Impacts on soil from structural and nonstructural range improvements{ XE "Range Improvement" } would occur. In GSENM, the BLM would maintain or restore ranges with native species. Passive restoration	Nature and Type of Effects. There would be 2,135,200 acres (95 percent of the decision area) available for livestock grazing. There would be 46,200 more acres (2 percent of the decision area) available for livestock grazing than under Alternative A. Because more livestock would be on the landscape, there is an increased likelihood that grazing would impact soils, making it increasingly difficult to meet BLM Utah Rangeland Health{ XE "Rangeland Health" } Standards compared with Alternative A. There are 1,319,600 acres (59 percent of the decision area) that would be available for livestock grazing on sensitive soils (BLM GIS 2014). Compared with Alternative A, the area where livestock activities would occur on sensitive soils would increase by two percent of the decision area, thereby increasing impacts on these soil types. Impacts on soil from structural and nonstructural range improvements{ XE	Nature and Type of Effects. There would be 2,065,300 acres (91 percent of the decision area) available for livestock grazing. There would be 23,700 fewer acres (one percent of the decision area) available for livestock grazing than under Alternative A. Compared with Alternative A, there would be slightly fewer impacts on soil, because slightly less area would be grazed. The intensity of impacts would be about the same as under Alternative A. There are 1,273,700 acres (57 percent of the decision area) where livestock grazing activities (available for grazing, reserve common allotments{ XE "Reserve Common Allotment" }, and trailing) would occur on sensitive soils (BLM GIS 2014). The impacts would be similar to those under Alternative A, except unalloted acres in Alternative A would become unavailable for grazing under Alternative E. Impacts on soil from structural and nonstructural range improvements{ XE

Alternative A (No Action)	Alternative B	Alternative C	Alternative D	Alternative E
on all six allotments. In these allotments, 379,400 acres (17 percent of the decision area) would continue to be available for livestock grazing (BLM GIS 2014). Since 2006, the BLM, in coordination with permittees, has made changes in the six allotments, resulting in progress toward meeting standards	progress toward meeting standards. This trend would increase under Alternative B, because there would be no grazing to affect the allotments that do not meet Standard 1. However, the BLM would not have permittees with which to partner under this alternative.	and non-chemical methods would be implemented. Compared with Alternative A, livestock grazing would be managed or discontinued to reduce conflicts with soil resources thereby minimizing impacts on soil, such as during critical times of the year. There are six livestock grazing allotments in the decision area that do not meet Standard 1, and livestock grazing was determined to be the cause on all six allotments. Of these areas, livestock grazing would be available on 329,300 acres (14 percent of the decision area; BLM GIS 2014). Because livestock grazing would not occur in some allotments, these areas have a higher potential for meeting Standard 1 more quickly under Alternative C than under Alternative A.	"Range Improvement" } would occur. In GSENM, the BLM would maintain or restore ranges with native and nonnative species and would allow a variety of vegetation restoration methods. The BLM would maintain structural range improvements so that forage reserves would be ready for use when needed. In GSENM and Glen Canyon, the BLM and NPS would adaptively manage the season-of-use, duration, distribution, and stocking rate{ XE "Stocking Rate" }. In order to provide for the optimum level of livestock grazing and the attainment of healthy rangelands, Alternative D contains more structural and nonstructural range improvements than Alternative A. There are six livestock grazing allotments in the decision area that do not meet Standard 1, and livestock grazing was determined to be the cause on all six allotments. Of these areas, 396,200 acres (18 percent of the decision area) would continue to be available for livestock grazing	"Range Improvement" } would occur. In GSENM, the BLM would maintain or restore ranges with native and nonnative species and would allow a variety of vegetation restoration methods. The BLM would authorize structural range improvements consistent with the MMP{ XE "Monument Management Plan, Grand Staircase-Escalante National Monument (MMP 2000)" } or with the Kanab or Arizona Strip RMPs, where applicable. Also in GSENM, the BLM would adaptively manage season of use, duration, distribution, and stocking rate{ XE "Stocking Rate" }. Additionally, nonstructural range improvements{ XE "Range Improvement" } would be managed both for ecosystem processes and forage production. Compared with Alternative A, Alternative E emphasizes multiple use and sustained yield through grazing management. It is designed to ensure that BLM Utah Rangeland Health{ XE "Rangeland Health" } Standards are achieved and

Alternative A (No Action)	Alternative B	Alternative C	Alternative D	Alternative E
			(BLM GIS 2014). The impacts on soil would be similar to those under Alternative A, except for the additional 16,800 acres in Upper Paria that would be available under Alternative D for livestock grazing.	that land health is improved. There are six livestock grazing allotments in the decision area that do not meet Standard 1, and livestock grazing was determined to be the cause on all six allotments. The impacts would be the same as those under Alternative D.
Water Resources				
Impacts on water from livestock and livestock management involving sedimentation, contamination, and authorized uses would continue, as described in Section 4.6.3 Nature and Type of Effects. There would continue to be 2,089,000 acres (93 percent of the decision area) available for livestock grazing where impacts on water would occur. Impacts on water from structural and nonstructural range improvements{ XE "Range Improvement" } would continue from current management under Alternative A. In GSENM, the BLM would continue to use water developments as a management tool.	Impacts on water from structural and nonstructural range improvements{ XE "Range Improvement" } would occur, as described in Section 4.6.3 Nature and Type of Effects. There would be no livestock grazing under Alternative B; consequently, there would be no impacts on water from livestock. Alternative B would have the least impacts on water from livestock. It is important to note, however, that livestock grazing would likely be replaced by other activities. Impacts on water from those activities would be speculative, because those activities are unknown at this time. Impacts on ~~soil~~ water from structural and nonstructural	Impacts on water from livestock and livestock management involving sedimentation, contamination, and authorized uses would occur, as described in Section 4.6.3 Nature and Type of Effects. There would be 1,619,700 acres (72 percent of the decision area) available for livestock grazing where impacts on water would occur. Impacts on water from structural and nonstructural range improvements{ XE "Range Improvement" } would occur. In GSENM, where water developments are necessary for livestock grazing and protection of Monument objects, such developments would be	Impacts on water from livestock and livestock management involving sedimentation, contamination, and authorized uses would occur, as described in Section 4.6.3 Nature and Type of Effects. There would be 2,135,200 acres (95 percent of the decision area) available for livestock grazing where impacts on water would occur. Impacts on water from structural and nonstructural range improvements{ XE "Range Improvement" } would occur. In GSENM, the BLM would authorize water developments for predetermined purposes. In GSENM, the BLM would allow experimental use of	Impacts on water from livestock and livestock management involving sedimentation, contamination, and authorized uses would occur, as described in Section 4.6.3 Nature and Type of Effects. There would be 2,065,300 acres (91 percent of the decision area) available for livestock grazing where impacts on water would occur. Impacts on water from structural and nonstructural range improvements{ XE "Range Improvement" } would occur. In GSENM, the BLM would authorize water developments for predetermined purposes. New water developments would be considered within

Alternative A (No Action)	Alternative B	Alternative C	Alternative D	Alternative E
Nonstructural range improvements and land treatments are not appropriate in Glen Canyon. In Glen Canyon, all water developments must consider the needs of wildlife and recreation. Livestock grazing would continue to be available on allotments containing 92.6 miles of 303(d)-listed streams (BLM GIS 2014). Within allotments in the decision area that do not meet Standard 4, there would continue to be 543,000 acres (24 percent of the decision area) available for livestock grazing (BLM GIS 2014). Since 2006, the BLM, in coordination with permittees, has made changes in the six allotments, resulting in progress toward meeting standards	range improvements{ XE "Range Improvement" } would still occur. In GSENM, the BLM would restore ranges with native species. In GSENM and Glen Canyon, structural range improvements may be removed. Removing structural range improvements would restore the natural conditions of the ranges. It would allow natural soil conditions to develop over larger areas, thereby minimizing the transport of soil capable of affecting water quality and stream conditions. Compared with Alternative A, Alternative B would maintain or restore water conditions over a larger area. There would be 130.8 miles of 303(d)-listed streams on lands unavailable for livestock grazing (BLM GIS 2014). Compared with Alternative A, Alternative B would remove all livestock that contribute to water contamination, thereby increasing the opportunities for improved water quality and conditions. There would be no acres available for livestock grazing in allotments that do not	managed. Also, new water developments would be considered within Glen Canyon outside of the proposed wilderness area. Compared with Alternative A, livestock grazing would be managed or discontinued to reduce conflicts to resources, including water resources. Changes in grazing systems would be taken into consideration before range improvements are implemented. This which would minimize impacts on water, such as during critical times of the year. Livestock grazing would occur in allotments available for grazing or trailing that contain 78.4 miles of 303(d)-listed streams (BLM GIS 2014). Compared with Alternative A, Alternative C would decrease livestock activities on allotments containing 14.2 miles of 303(d)-listed streams, thereby increasing the opportunities for improved water quality and conditions. Within allotments in the decision area that do not meet Standard 4, there would be 407,000 acres (18 percent of the decision area) available for livestock grazing (BLM GIS	electric fences, other fence design, season of use, supplement and salt placement, water developments, and vegetation treatments{ XE "Vegetation Treatment" }, including prescribed fire. Also, new water developments would be considered within Glen Canyon, outside of the proposed wilderness area. Livestock management would promote land health improvements, which would involve water resources. Management would also promote maintaining range improvements{ XE "Range Improvement" }. In order to provide for the optimum level of livestock grazing and the attainment of healthy rangelands, Alternative D contains more structural and nonstructural range improvements than Alternative A. Livestock grazing would be available on allotments containing 125.8 miles of 303(d)-listed streams (BLM GIS 2014). Compared with Alternative A, Alternative D would increase livestock grazing on allotments containing 33.2 miles of	Glen Canyon outside of the proposed wilderness area. Nonstructural range improvements{ XE "Range Improvement" } would be managed for both ecosystem processes and forage production. Compared with Alternative A, Alternative E emphasizes multiple use and sustained yield through grazing management. This is designed to ensure that BLM Utah Rangeland Health{ XE "Rangeland Health" } Standards are achieved and land health is improved. Livestock grazing would occur in allotments available for grazing or trailing that contain 106.9 miles of 303(d)-listed streams (BLM GIS 2014). Compared with Alternative A, Alternative E would increase livestock grazing on allotments containing 14.3 miles of 303(d)-listed streams, thereby increasing the opportunities for livestock to alter water quality and conditions for these streams. With respect to allotments in the decision area that do not meet Standard 4, the impacts would be similar to Alternative A, except the

Alternative A (No Action)	Alternative B	Alternative C	Alternative D	Alternative E
	meet Standard 4 (BLM GIS 2014). Compared with Alternative A, Alternative B would remove all livestock that affect an allotment being able to meet Standard 4, thereby increasing the opportunities for the allotment to meet Standard 4 more quickly than under Alternative A.	2014). Compared with Alternative A, Alternative C would decrease the acres available for livestock grazing in these allotments by 136,000 acres (6 percent of the decision area). This would increase the opportunities for the areas to meet Standard 4 more quickly than under Alternative A.	303(d)-listed streams, thereby increasing the opportunities for livestock to alter water quality and conditions in these streams. Within allotments in the decision area that do not meet Standard 4, there would be 543,400 acres (24 percent of the decision area) available for livestock grazing (BLM GIS 2014). The impacts on water would be similar to those under Alternative A, except for the additional 380 acres under Alternative D that would be available for livestock grazing in Rock Creek-Mudholes.	Rock Creek-Mudholes allotment (1,574 acres) would be a reserve common allotment{ XE "Reserve Common Allotment" } under Alternative E. This would increase the opportunities for the area to meet Standard 4, because it would likely be grazed less under Alternative E.
Recreation				
There would continue to be the potential for livestock grazing to influence recreation setting characteristics and opportunities on 2,089,200 acres (93 percent) of the planning area managed as available for livestock grazing. ~~The average acreage per AUM would be 50.~~ The intensity of impacts would be in direct proportion to the density of grazing activity and number of recreationists in a given area. Accordingly, the greatest potential for impacts on recreation from grazing	There would be no livestock use under Alternative B, which would eliminate the potential for conflicts between recreation and livestock. Alternative B would also eliminate opportunities for visitors to experience cattle ranching activities. Removing structural range improvements{ XE "Range Improvement" } would eliminate the potential for those features to obstruct recreation access or modify recreation settings. Overall,	Managing 469,300 fewer acres as available for grazing compared with Alternative A, would reduce the overall area where grazing could conflict with recreation by 22 percent. In SRMAs{ XE "Special Recreation Management Area (SRMA)" }, there would be a 19 percent (177,700 acre) reduction in areas available for grazing. ~~There would be an average maximum density of 25 acres per AUM, which~~The decrease in AUMs would further reduce the	Alternative D would result in a 2 percent (46,200-acre) increase in the overall portion of the planning area where livestock grazing could conflict with recreation settings and opportunities compared with Alternative A. Increasing grazing in SRMAs{ XE "Special Recreation Management Area (SRMA)" } by 80,600 acres would affect recreation settings and opportunities, particularly in the Escalante Canyon and Paria-Hackberry SRMAs, the two most visited SRMAs in	There would be 23,700 (1 percent) fewer overall acres where livestock grazing would impact recreation compared with Alternative A. However, in SRMAs{ XE "Special Recreation Management Area (SRMA)" }, there would be a net 1,900 acres fewer acres in SRMAs available for grazing resulting in a slightly greater area where impacts on recreation from grazing could occur. The greatest potential for impacts would be in the Paria-Hackberry SRMA, where

Alternative A (No Action)	Alternative B	Alternative C	Alternative D	Alternative E
would be near popular recreation areas and trails frequently used by livestock. This would include the 935,600 acres of SRMAs{ XE "Special Recreation Management Area (SRMA)" } in GSENM. Alternative A would continue to provide visitors with opportunities to see livestock grazing on public lands. Grazing impacts on recreation settings and opportunities in the backcountry would be less frequent because fewer visitors would experience a change in their recreation setting or opportunity from grazing. However, visitors' encounters with livestock, manure, or range improvements{ XE "Range Improvement" } in the backcountry would result in a more intense impact on the recreation setting because the activity would contrast more sharply with the undeveloped recreation setting. Structural range improvements{ XE "Range Improvement" } would continue to influence the recreation setting and	there would be an increase in the quality and quantity of recreation opportunities in GSENM and Glen Canyon NRA, compared with Alternative A.	potential for impacts on recreation settings and opportunities compared with Alternative A. It would also reduce opportunities for visitors to observe cattle grazing. In areas available for grazing, there would still be the potential for livestock to impact recreation settings and opportunities, particularly near popular recreation areas. Impacts from structural and nonstructural range improvements{ XE "Range Improvement" } would be similar to Alternative A. Season of use management would rest allotments or reduce AUMs in certain areas to protect other resources. This would also reduce the potential for conflict with recreation uses, particularly during the late spring{ XE "Spring" } and summer.	the planning area. Visitors would have slightly more opportunities to view livestock grazing, which may improve recreation experiences for some visitors. Impacts on recreation from the density of livestock would be the same as Alternative A. Structural and nonstructural range improvement{ XE "Range Improvement" } impacts on recreation would be similar to Alternative A, with the exception that new line cabins in Glen Canyon could modify recreation setting characteristics. The potential for impacts would be greatest in remote areas where the cabins would contrast with the primitive recreation setting.	16,800 additional acres would be available for grazing. Impacts from grazing density would be nearly the same as Alternative A as would visitors' opportunities to view livestock grazing on public lands. Impacts from structural and nonstructural range improvements{ XE "Range Improvement" } would be the same as Alternative A. Reducing or temporarily eliminating grazing from areas adjacent to Highways 12 and 89 would reduce conflicts in these areas but would also limit visitors' opportunities to observe grazing in GSENM. Adaptive management would reduce the potential for recreation conflicts, especially in or adjacent to high-use recreation areas.

Alternative A (No Action)	Alternative B	Alternative C	Alternative D	Alternative E
opportunities by modifying the visual setting and obstructing access to certain areas. At the same time, fences and other range improvements would prevent livestock from wandering onto roads, trails, and other areas where people recreate. Nonstructural range improvements{ XE "Range Improvement" }, such as reseeding, could displace visitors in the short-term. In the long-term, restoration would improve the recreation setting and quality of recreation opportunities.				
Air Quality and Climate Change				
Livestock grazing and its associated activities are not a significant source of air pollutant emissions in the planning area and would not impact air quality conditions over the long term. Structural improvements, vegetation treatments{ XE "Vegetation Treatment" }, and vehicle use would be short-term, direct sources of emissions. Grazing would be source of indirect particulate emissions resulting from surface disturbance and wind erosion.	Livestock grazing would not occur under Alternative B, so there would be no direct impacts on air quality from that use. Exposed soils would continue to be a source of fugitive dust emissions until actively or passively restored. Eliminating livestock grazing would eliminate greenhouse gas emissions from this source in the decision area and would reduce greenhouse gas emissions, compared with Alternative A. In the planning area, greenhouse gas emissions from livestock	The types of direct and indirect impacts would be the same as described for Alternative A. Criteria pollutant{ XE "Criteria Pollutant" } emissions and greenhouse gas emissions would be less than under Alternative A. Alternative C would provide more protection to sensitive soil types and would decrease windblown particulate emissions compared to Alternative A. Carbon storage levels under Alternative C would likely increase	The types of direct and indirect impacts would be the same as described for Alternative A. Alternative D would have slightly greater criteria pollutant{ XE "Criteria Pollutant" } and greenhouse gas emissions, compared with Alternative A. In addition, carbon storage levels under Alternative D would be similar to or slightly less than under Alternative A. Greenhouse gas emissions	The types of direct and indirect impacts would be the same as described for Alternative A. Alternative E would have the same or slightly fewer criteria pollutant{ XE "Criteria Pollutant" } and greenhouse gas emissions, compared with Alternative A. In addition, carbon storage levels under Alternative E would likely be similar to or slightly more, compared with Alternative A. Greenhouse gas emissions

Alternative A (No Action)	Alternative B	Alternative C	Alternative D	Alternative E
Over the long term, vegetation treatments{ XE "Vegetation Treatment" } would decrease the potential for fugitive particulate emissions from soil erosion, decrease susceptibility to wildfire, and increase carbon storage in soils and vegetation. Methane emissions from livestock grazing would be a small incremental source of greenhouse gas emissions (0.0001 percent of state emissions [2011 levels]).	grazing would remain the same, if livestock that historically grazed on decision area lands were shifted to lands outside of the decision area. Grazing is a small incremental source of greenhouse gas emissions in the planning area.	compared to Alternative A. Greenhouse gas emissions from enteric fermentation would be similar to Alternative A and a small incremental source of greenhouse gas emissions.	from enteric fermentation would be similar to Alternative A and a small incremental source of greenhouse gas emissions.	from enteric fermentation would be similar to Alternative A and a small incremental source of greenhouse gas emissions.
Fish and Wildlife				
Livestock grazing management would meet or move toward meeting Utah rangeland health{ XE "Rangeland Health" } standards. This requirement would ensure that components of fish and wildlife habitat like soils, vegetation, and wetland{ XE "Wetland" } and riparian areas{ XE "Riparian Area" } are maintained in the long term. Nonstructural range improvements{ XE "Range Improvement" } (mechanical, prescribed fire, chemical) would continue to be implemented, and may	Since there would be no livestock grazing under Alternative B, impacts on fish and wildlife would be limited to those from removing structural range improvements{ XE "Range Improvement" } and restoring nonstructural range improvements consistent with the MMP{ XE "Monument Management Plan, Grand Staircase-Escalante National Monument (MMP 2000)" }. Impacts would be similar to those under Alternative A but would be greatly reduced.	Impacts on fish and wildlife habitat from meeting or moving toward Utah rangeland health{ XE "Rangeland Health" } standards would be as described under Alternative A. Managing large ungrazed reference areas under Alternative C would generally result in reduced impacts compared to Alternative A. Nonstructural range improvements{ XE "Range Improvement" } would emphasize native plant species, passive restoration,	Impacts on fish and wildlife habitat from meeting or moving toward Utah rangeland health{ XE "Rangeland Health" } standards would be as described under Alternative A. Fewer limits on nonstructural range improvements{ XE "Range Improvement" } like aerial chemical spraying and prescribed fire under Alternative D would increase short term impacts on fish and wildlife species compared to Alternative A. The resulting long term habitat improvements would be	Impacts on fish and wildlife habitat from meeting or moving toward Utah rangeland health{ XE "Rangeland Health" } standards would be as described under Alternative A. Fewer limits on nonstructural range improvements{ XE "Range Improvement" } like aerial chemical spraying and prescribed fire under Alternative E would increase short term impacts on fish and wildlife species compared to Alternative A. However, emphasizing and perpetuating native seed use in treatments

Alternative A (No Action)	Alternative B	Alternative C	Alternative D	Alternative E
temporarily impact fish and wildlife species by displacement or short term reduction in habitat quality. In the long term, fish and wildlife habitat would be improved. Structural range improvements{ XE "Range Improvement" } (fencing, water developments) would impact fish and wildlife habitat in the short term by disturbing soils and increasing potential for weed establishment and spread, but would improve habitat in the long term by protecting sensitive habitat like wetlands{ XE "Wetland" } and riparian areas{ XE "Riparian Area" }. Most big game habitat would continue to be available for livestock grazing. Impacts could include altered forage availability and competition for forage, habitat avoidance, and habitat fragmentation. Alternatively, habitat quality would be improved by nonstructural range improvements{ XE "Range Improvement" } in the long term, and water developments may provide increased water availability.		and non-chemical treatments. Short term impacts on fish and wildlife species would be reduced compared to Alternative A, but long term habitat improvement would progress more slowly. Impacts from structural range improvements{ XE "Range Improvement" } would be the same as described under Alternative A. Fewer acres of big game habitat would be available to livestock grazing compared to Alternative A, reducing impacts. However, fewer nonstructural range improvements{ XE "Range Improvement" } and water developments would limit habitat quality improvement in the long term compared to Alternative A.	similar to Alternative A. Impacts from structural range improvements{ XE "Range Improvement" } would be the same as described under Alternative A. Slightly more acres of big game habitat would be available to livestock grazing compared to Alternative A, somewhat increasing impacts. Impacts from long term habitat quality increases and water availability would be similar to those described under Alternative A.	would increase fish and wildlife habitat quality in the long term compared to Alternative A. Impacts from structural range improvements{ XE "Range Improvement" } would be the same as described under Alternative A. Slightly fewer acres of big game habitat would be available to livestock grazing compared to Alternative A, somewhat reducing impacts. Impacts from long term habitat quality increases and water availability would be similar to those described under Alternative A.
Special Status Species				

FOIA001:01673151

Alternative A (No Action)	Alternative B	Alternative C	Alternative D	Alternative E
Livestock grazing management would meet or move toward meeting Utah rangeland health{ XE "Rangeland Health" } standards. This requirement would ensure that special status species are maintained at an appropriate level as indicated by population numbers, habitat connectivity, and habitat improvement. 95 percent of critical habitat and all PACs{ XE "Protected Activity Center (PAC)" } for Mexican spotted owl, and all critical habitat for southwestern willow flycatcher~~, and 97 percent of greater sage grouse{ XE "Greater Sage Grouse" } PHMA{ XE "Priority Habitat Management Area (PHMA)" }~~ would continue to be available for livestock grazing. 88 percent of riparian habitat for listed riparian birds would be available. 97 percent of greater sage-grouse{ XE "Greater Sage-Grouse" } PHMA{ XE "Priority Habitat Management Area (PHMA)" } would continue to be available for livestock	Since there would be no livestock grazing under Alternative B, impacts on special status species would be limited to those from removing structural range improvements{ XE "Range Improvement" } and restoring nonstructural range improvements consistent with the MMP{ XE "Monument Management Plan, Grand Staircase-Escalante National Monument (MMP 2000)" }. Impacts would be similar to those under Alternative A but would be greatly reduced.	Impacts on special status species from meeting or moving toward Utah rangeland health{ XE "Rangeland Health" } standards would be as described under Alternative A. Managing large ungrazed reference areas under Alternative C would generally result in reduced impacts compared to Alternative A. 76 percent of critical habitat and 60 percent of PAC{ XE "Protected Activity Center (PAC)" } acreage for Mexican spotted owl, 9 percent of critical habitat for southwestern willow flycatcher~~, and 97 percent of greater sage-grouse{ XE "Greater Sage Grouse" } PHMA{ XE "Priority Habitat Management Area (PHMA)" }~~ would continue to be available for livestock grazing. 66 percent of riparian habitat for listed riparian birds would be available. Acres of greater sage-grouse{ XE "Greater Sage-Grouse" } PHMA{ XE "Priority Habitat Management Area (PHMA)" } available to	Impacts on special status species from meeting or moving toward Utah rangeland health{ XE "Rangeland Health" } standards would be as described under Alternative A. Mexican spotted owl critical habitat and PACs{ XE "Protected Activity Center (PAC)" } and southwestern willow flycatcher critical habitat, and greater sage-grouse{ XE "Greater Sage-Grouse" } PHMA{ XE "Priority Habitat Management Area (PHMA)" } available under Alternative D would be nearly the same as under Alternative A. 95 percent of riparian habitat for listed riparian birds would be available, increasing impacts compared to Alternative A. Impacts on Kodachrome bladderpod, Jones' cycladenia, and Ute ladies'-tresses would be the same as described under Alternative A. Fewer limits on nonstructural range improvements{ XE "Range Improvement" } like aerial chemical spraying and	Impacts on special status species from meeting or moving toward Utah rangeland health{ XE "Rangeland Health" } standards would be as described under Alternative A. Mexican spotted owl critical habitat and PACs{ XE "Protected Activity Center (PAC)" } and southwestern willow flycatcher critical habitat~~, and greater sage-grouse{ XE "Greater Sage Grouse" } PHMA{ XE "Priority Habitat Management Area (PHMA)" }~~ available under Alternative E would be nearly the same as under Alternative A. 90 percent of riparian habitat for listed riparian birds would be available, increasing impacts compared to Alternative A. Acres of greater sage-grouse{ XE "Greater Sage-Grouse" } PHMA{ XE "Priority Habitat Management Area (PHMA)" } available to livestock grazing would be the same as described under Alternative A, however, 29 percent fewer AUMs would be available, reducing impacts

DOI-2019-10 02222

Alternative A (No Action)	Alternative B	Alternative C	Alternative D	Alternative E
grazing. All occupied Kodachrome bladderpod habitat and nearly all Jones' cycladenia habitat would be available; however, since Jones' cycladenia grows on livestock-inaccessible slopes, no impacts would occur. All known Ute ladies'-tresses locations would be similarly available. Nonstructural range improvements{ XE "Range Improvement" } would continue to occur and may displace or disrupt breeding for special status wildlife, or result in special status plant mortality if conducted in suitable habitat. Structural range improvements{ XE "Range Improvement" } in riparian areas{ XE "Riparian Area" } may similarly displace or disrupt listed riparian bird species in the short term but would result in long term habitat improvements. Livestock grazing may provide periodic cattle carcass forage opportunities for California condor.		livestock grazing would be the same as described under Alternative A, however, 41 percent fewer AUMs would be available, reducing impacts compared to Alternative A. Impacts on Kodachrome bladderpod, Jones' cycladenia, and Ute ladies'-tresses would be the same as described under Alternative A. Nonstructural range improvements{ XE "Range Improvement" } would emphasize native plant species, passive restoration, and non-chemical treatments. Short term impacts on special status species would be reduced compared to Alternative A, but long term habitat improvement would progress more slowly. Impacts from structural range improvements{ XE "Range Improvement" } would be the same as described under Alternative A. Because fewer acres would be available and fewer AUMs allocated to livestock grazing, cattle carcass forage opportunities for California	prescribed fire under Alternative D would increase short term impacts on special status species compared to Alternative A. The resulting long term habitat improvements would be similar to Alternative A. Impacts from structural range improvements{ XE "Range Improvement" } would be the same as described under Alternative A. Impacts on California condor from cattle carcass forage availability would be the same as described under Alternative A.	compared to Alternative A. Impacts on Kodachrome bladderpod, Jones' cycladenia, and Ute ladies'-tresses would be the same as described under Alternative A. Fewer limits on nonstructural range improvements{ XE "Range Improvement" } like aerial chemical spraying and prescribed fire under Alternative E would increase short term impacts on special status species compared to Alternative A. However, emphasizing and perpetuating native seed use in treatments would increase habitat quality in the long term compared to Alternative A. Impacts from structural range improvements{ XE "Range Improvement" } would be the same as described under Alternative A. Because fewer acres would be available and fewer AUMs allocated to livestock grazing, cattle carcass forage opportunities for California condor would be reduced compared to Alternative A.

FOIA001:01673151

Alternative A (No Action)	Alternative B	Alternative C	Alternative D	Alternative E
		condor would be reduced compared to Alternative A.		
Cultural Resources				
Combined with acres available for grazing and structural and nonstructural range improvements{ XE "Range Improvement" }, Alternative A would be expected to continue to result in both direct and indirect adverse effects. However, they may be minimized with the adoption of the Cultural Resources Management Protocol (**Appendix C**).	Alternative B would be expected to reduce grazing-related impacts or adverse effects on historic properties throughout the decision area, when compared with Alternative A. However, removing range improvements{ XE "Range Improvement" } could involve ground-disturbing activities, which may impact historic properties, either directly or indirectly. In addition, if a cultural landscape, TCP{ XE "Traditional Cultural Property (TCP)" }, or other historic property, where ranching is a core element of its historic significance, were to be defined and eligible for listing on the NRHP{ XE "National Register of Historic Places (NRHP)" }, certain actions could be considered an adverse effect under Section 106 of the NHPA{ XE "National Historic Preservation Act (NHPA)" }. An example of these actions is removing ranching from the decision area, along with cattle, stock	Alternative C would be expected to reduce grazing-related impacts or adverse effects on historic properties throughout the decision area, when compared with Alternative A. However, potential structural and nonstructural range improvements{ XE "Range Improvement" } associated with Alternative C involving ground-disturbing activities, fire, and herbicides may impact historic properties, either directly or indirectly. Potential direct and indirect impacts or adverse effects under Alternative C may be minimized with the adoption of the Cultural Resources Management Protocol (**Appendix C**).	Alternative D would likely have grazing-related impacts or adverse effects on historic properties throughout the decision area that would be similar to those under Alternative A. However, some sites now protected from grazing impacts would be open to grazing under Alternative D. Therefore, they could be open to new grazing-related impacts not experienced under Alternative A. Potential direct and indirect impacts or adverse effects under Alternative D may be minimized with the adoption of the Cultural Resources Management Protocol (**Appendix C**).	Alternative E could result in a slight decrease of grazing-related impacts or adverse effects on historic properties throughout the decision area, when compared with Alternatives A. Potential direct and indirect impacts or adverse effects under Alternative E may be minimized with the adoption of the Cultural Resources Management Protocol (**Appendix C**).

DOI-2019-10 02224

Alternative A (No Action)	Alternative B	Alternative C	Alternative D	Alternative E
	tanks, windmill-pump waters, fence lines, corrals, trails, and other ranching-related resources.			
Paleontological Resources				
In general, no impacts on paleontological resources{ XE "Paleontological Resource" } are anticipated as a result of Alternative A. Fossil resources in bluff shelters and coves do occur, albeit extremely rare, and nearly all the fossils are coprolite deposits. Possible mitigation measures are to place physical grazing exclosures around such sites or to amend allotments to keep livestock out of the sensitive areas.	No grazing-related impacts to paleontological resources{ XE "Paleontological Resource" } would occur under Alternative B.	Same as Alternative A.	Same as Alternative A.	Same as Alternative A.
Visual and Scenic Resources				
Some nonstructural and structural range improvements{ XE "Range Improvement" }, if designed and implemented properly, could meet the objectives of all BLM VRM classes. However, there are other improvements that would not meet the objectives, especially those objectives for preserving the existing character of the landscape and those for primarily providing for natural	Under Alternative B, livestock grazing would be discontinued so there would be no impacts on visual resources from new structural or nonstructural range improvements{ XE "Range Improvement" } in GSENM or Glen Canyon. Removing range improvements{ XE "Range Improvement" } and implementing any necessary reclamation would remove features that potentially	Because livestock grazing would decrease under this alternative, there would likely be less of a need for new structural and nonstructural range improvements{ XE "Range Improvement" }. Impacts on both BLM- and NPS-managed lands would be less than under Alternative A.	On BLM-managed lands, there would be a slight increase in livestock grazing compared with Alternative A, so there could be slightly more opportunities for impacts on visual resources from new structural and nonstructural range improvements{ XE "Range Improvement" }. There would be an increase in acres available for livestock grazing in VRM Class I, II, and III areas. While only fences, gates, and corrals could	Impacts under Alternative E would be slightly reduced from Alternative A because there would be fewer acres available for livestock grazing. this is true for both BLM- and NPS-managed lands.

Alternative A (No Action)	Alternative B	Alternative C	Alternative D	Alternative E
ecological changes (VRM Class I). The nonstructural range improvements that could be designed to meet the objectives of all VRM classes include manual treatments, prescribed fire, and manual revegetation. The structural range improvements that could be designed to meet the objectives of all VRM classes include fences, gates, and corrals. Aside from Alternative D, Alternative A has the most acres available for livestock grazing where structural and nonstructural range improvements would typically meet or could potentially meet VRM Class objectives. For NPS-managed lands, there would be no nonstructural range improvements{ XE "Range Improvement" } to improve forage for livestock. Structural range improvements such as fences and gates, cattle guards, water catchments, and water pipelines could meet the objectives of the Recreation and Resource Utilization{ XE "Utilization" } Zone. All types of structural range improvements would be allowed in the Development	contrast with the natural landscape character and return those areas to a natural appearance. Removing unnecessary structural range improvements and implementing reclamation would meet the objectives of all VRM classes and could improve the inventoried scenic quality values. Removing range improvements would also be permissible in all of the NPS management zones and could improve the scenic values.		potentially meet VRM Class I objectives, there would be an increase in acres where other types of structural and nonstructural range improvements could meet VRM Class II and III objectives, so it is possible that there would be an increase in these types of activities. On NPS-managed lands, impacts on scenic resources would be the same as under Alternative A.	

Alternative A (No Action)	Alternative B	Alternative C	Alternative D	Alternative E
Zone. Alternatives A and D have the same number of acres available for livestock grazing in the Recreation and Resource Utilization Zone and the Development Zone, where the most types of structural range improvements could occur.				
~~*Wildland Fire Management*~~				
Lands with Wilderness Characteristics				
Management of lands with wilderness characteristics would continue via the existing Management Zones and 2,000 acres would be unavailable for livestock grazing.	Management of lands with wilderness characteristics would continue via the existing Management Zones. Zero acres of lands with wilderness characteristics would be available for livestock grazing, and existing range improvements{ XE "Range Improvement" } may be removed; thus, the protection of wilderness characteristics would increase, in comparison with Alternative A and Alternative B would have the least potential for impacts among the action alternatives~~.~~	Management of lands with wilderness characteristics would continue via the existing Management Zones. Under this alternative, 69,800 acres of lands with wilderness characteristics would be unavailable for livestock grazing and passive management emphasized. Protection of wilderness characteristics would increase in comparison with Alternative A.	Management of lands with wilderness characteristics would continue via the existing Management Zones. Under this alternative, 1,300 acres of lands with wilderness characteristics would be unavailable for livestock grazing and the emphasis on active management through implementation of structural and nonstructural range improvements{ XE "Range Improvement" } would increase. Protection of wilderness characteristics would decrease in comparison with Alternative A and Alternative D would have the most potential for impacts among the action alternatives~~.~~	Management of lands with wilderness characteristics would continue via the existing Management Zones. Under this alternative, 2,000 acres of lands with wilderness characteristics would be unavailable for livestock grazing; however, some previously unalloted areas would be available for livestock grazing. Because the previously unallotted areas would become available, the protection of wilderness characteristics would decrease, in comparison with Alternative A.
Wild and Scenic Rivers				
Management of 180 miles of	No action would impair the	No action would impair the	No action would impair the	No action would impair the

Alternative A (No Action)	Alternative B	Alternative C	Alternative D	Alternative E
suitable WSR corridors as available for livestock grazing and 80 miles of suitable WSR corridors as unavailable for livestock grazing would continue. No action would impair the free-flowing nature of a river segment.	free-flowing nature of a river segment. All suitable WSR corridors would be unavailable for livestock grazing, which diminishes the magnitude of impacts on ORVs and water quality. Protection of suitable WSR corridors would increase in comparison with Alternative A.	free-flowing nature of a river segment. Miles of suitable WSR segments unavailable for livestock grazing would increase to by 105 miles, which would diminish the magnitude of impacts on ORVs and water quality. Protection of suitable WSR corridors would increase in comparison with Alternative A.	free-flowing nature of a river segment. Miles of suitable WSR segments available for livestock grazing would increase by 50 miles, which would increase the magnitude of impacts on ORVs and water quality. Protection of suitable WSR corridors would decrease in comparison with Alternative A.	free-flowing nature of a river segment. Miles of suitable WSR segments unavailable for livestock grazing would increase by 20 miles, which would diminish the magnitude of impacts on ORVs and water quality. Protection of suitable WSR corridors would be similar, but slightly increased, in comparison with Alternative A.
BLM Wilderness ~~*and Wilderness Study Areas and NPS Proposed Wilderness*~~				
Livestock grazing in the Paria Canyon-Vermilion Cliffs Wilderness cannot increase (BLM 1984) and new improvements to support livestock grazing will not be authorized (43 CFR Section 6304.25(b)). While existing range improvements have local impacts on the untrammeled and natural character, such impacts are localized and do not detract from the unit as a whole. Because grazing would not increase and no new range improvements would be authorized, there would be no impacts on wilderness character under Alternatives A, C, D, or E. Under Alternative B, where livestock grazing would be discontinued and range improvements removed, the untrammeled and natural character of the Wilderness would be enhanced. Such enhancement would be limited to the locations of the range improvements.				
BLM ~~*Wilderness and*~~ ***Wilderness Study Areas*** ~~*and NPS Proposed Wilderness*~~				
Under Alternative A, ~~85~~ 94 percent of ~~wilderness areas,~~ WSAs~~, and NPS proposed wilderness~~ would continue to be available for livestock grazing. The potential of livestock grazing and management to diminish wilderness characteristics would continue in ~~areas of wilderness,~~ WSAs~~, and NPS proposed wilderness~~ that are available to livestock grazing.	All ~~wilderness areas,~~ WSAs~~, and NPS proposed wilderness~~ would be unavailable for livestock grazing. This would eliminate the potential for livestock grazing and management to diminish wilderness characteristics.	Under Alternative C, ~~233,300~~223,100 fewer acres of ~~wilderness,~~ WSAs~~, and NPS proposed wilderness~~ would be available for livestock grazing than under Alternative A. The reduction in available acres would reduce the potential for livestock grazing and management to diminish wilderness characteristics in comparison with Alternative A.	Under Alternative D, ~~28,600~~43,000 more acres of WSAs would be available for livestock grazing than under Alternative A. Overall, impacts ~~to wilderness areas,~~ on WSAs~~, and NPS proposed wilderness~~ would be similar to Alternative A, but the potential for livestock grazing and management to diminish wilderness characteristics in the additionally available WSA areas would increase.	Under Alternative E, ~~16,600~~2,200 more acres of WSAs ~~and 6,500 more acres of NPS proposed wilderness~~ would be unavailable for livestock grazing than under Alternative A. Overall, impacts ~~to wilderness areas,~~ on WSAs~~, and NPS proposed wilderness~~ would be similar to Alternative A, but the potential for livestock grazing and management to diminish wilderness characteristics in the additionally unavailable WSAs ~~areas and NPS proposed wilderness~~ would

FOIA001:01673151

Alternative A (No Action)	Alternative B	Alternative C	Alternative D	Alternative E
				decrease.
~~BLM Wilderness and Wilderness Study Areas and~~ NPS Proposed Wilderness				
Under Alternative A, ~~85~~ 58 percent of ~~wilderness areas, WSAs, and~~ NPS-proposed wilderness would continue to be available for livestock grazing. The potential of livestock grazing and management to diminish wilderness character~~istics~~ would continue in areas ~~of wilderness, WSA, and NPS-proposed wilderness~~ that are available ~~to~~ for livestock grazing.	All ~~wilderness areas, WSAs, and~~ NPS-proposed wilderness would be unavailable for livestock grazing. This would eliminate the potential for livestock grazing and management to diminish wilderness character~~istics~~.	Under Alternative C, ~~233,300~~24,900 fewer acres of ~~wilderness, WSAs, and~~ NPS-proposed wilderness would be available for livestock grazing than under Alternative A. The reduction in available acres would reduce the potential for livestock grazing and management to diminish wilderness character~~istics~~ in comparison with Alternative A.	Under Alternative D, ~~28,600~~1,600 ~~more~~ fewer acres of WSAs would be available for livestock grazing than under Alternative A. Overall, impacts ~~to wilderness areas, WSAs, and~~ on NPS-proposed wilderness would be similar to Alternative A, but the potential for livestock grazing and management to diminish wilderness character~~istics in the additionally available WSA areas would increase~~would be slightly reduced.	Under Alternative E, ~~16,600 more acres of WSAs and~~ 6,500 more acres of NPS-proposed wilderness would be unavailable for livestock grazing than under Alternative A. Overall, impacts ~~to wilderness areas, WSAs, and~~on NPS-proposed wilderness would be similar to Alternative A, but the potential for livestock grazing and management to diminish wilderness character~~istics~~ in the additionally unavailable ~~WSA areas and NPS~~ proposed wilderness would decrease.
Tribal Interests				
Alternative A would continue to result in both direct and indirect impacts or adverse effects. However, they may be minimized with the adoption of the Cultural Resources Management Protocol (**Appendix C**).	Alternative B would reduce grazing-related impacts or adverse effects on tribal resources and historic properties throughout the decision area, when compared with those alternatives that allow grazing to continue. However, removing range improvements{ XE "Range Improvement" } could involve ground-disturbing activities that may impact historic properties, either directly or indirectly.	Alternative C, compared with Alternative A, would reduce grazing-related impacts or adverse effects on tribal resources and historic properties throughout the decision area. However, under Alternative C, potential structural and nonstructural range improvements{ XE "Range Improvement" } involving ground-disturbing activities, fire, or herbicides may impact tribal resources and historic properties, either directly or indirectly. Potential direct and indirect impacts or adverse effects	Alternative D would likely have grazing-related impacts on these properties throughout the decision area; this is similar to Alternative A. However, some sites now protected from grazing impacts would be open to grazing under Alternative D. Therefore, they could be open to new grazing-related impacts not experienced under Alternative A. Potential direct and indirect impacts or adverse effects under Alternative D could be minimized with the adoption of the Cultural Resources	Alternative E could result in a slight decrease of grazing-related impacts or adverse effects on these properties throughout the decision area, when compared with Alternative A, because of the decreased AUMs and acres available. Potential direct and indirect impacts under Alternative E could be minimized with the adoption of the Cultural Resources Management Protocol (**Appendix C**).

Alternative A (No Action)	Alternative B	Alternative C	Alternative D	Alternative E
		under Alternative C may be minimized with the adoption of the Cultural Resources Management Protocol (**Appendix C**).	Management Protocol (**Appendix C**).	
Socioeconomics				
Note: Dollar amounts provided below represent the quantifiable economic impacts based on the maximum number of permitted AUMs. These numbers are estimates based on best available data and should be utilized only for comparison of impacts by alternatives. Refer to Section 4.18 for detailed assumptions and methodology utilized in economic modeling.				
AUMs would continue to be available at their currently permitted levels. No grazing permits{ XE "Permit, Grazing" } would be cancelled. Based on average actual use, annual net revenue for permittees is estimated to be $2,214,704.	Eliminating grazing would result in annual net revenue changes for individual permittees ranging from a loss of $358,761 to an increase of $10,606, under the modeled scenarios. All 136 grazing permits{ XE "Permit, Grazing" } would be cancelled (a 100 percent decrease).	Reducing AUMs would result in annual net revenue changes for individual permittees ranging from a loss of $207,641 to an increase of $2,047, under the modeled scenarios. The number of grazing permits{ XE "Permit, Grazing" } would decrease by 38 percent, as 52 permits would be cancelled.	Increasing AUMs would result in annual net revenue changes for individual permittees ranging from a loss of $227 to an increase of $165,517, under the modeled scenarios. No grazing permits{ XE "Permit, Grazing" } would be cancelled. Permits could be authorized for previously unallotted or unavailable areas that are now available for livestock grazing.	Reducing AUMs would result in annual net revenue changes for individual permittees ranging from a loss of $26,231 to an increase of $106, under the modeled scenarios. One grazing permit{ XE "Permit, Grazing" } would be cancelled, but permits could be authorized for the previously unavailable allotment that is now available for livestock grazing.
Environmental Justice				
Under Alternative A, a continuation of the current management direction for livestock grazing is unlikely to have disproportionately adverse impacts on low-income or minority populations.	There would be no disproportionately adverse impacts on low-income or minority populations under the no grazing Alternative B. However, as noted in Nature and Type of Impacts, disproportionately adverse impacts, such as the loss of ranching operation revenues, may occur for ranchers with small-scale operations, which may include those of low-income or minority status.	There would be no disproportionately adverse impacts on low-income or minority populations under Alternative C. However, as noted in Nature and Type of Impacts, disproportionately adverse impacts, such as the loss of ranching operation revenues, may occur for ranchers with small-scale operations, which may include those of low-income or minority status.	There would be no disproportionately adverse impacts on low-income or minority populations under Alternative D.	There would be no disproportionately adverse impacts on low-income or minority populations under Alternative E.

Alternative A (No Action)	Alternative B	Alternative C	Alternative D	Alternative E
	Differential impacts, such as enhanced native vegetation, could result on tribal populations who use the land for traditional cultural purposes under a no grazing alternative.			

This page intentionally left blank.

2-1 Voluntary Relinquishment Decision Tree

1

2-2 Allotments or Pastures Unavailable under all Action Alternatives

2-3 Alternative A

1

2-4 Alternative B

2-5 Alternative C

2-6 Alternative D

2-7 Alternative E

This page intentionally left blank.

2.9 REFERENCES

BLM (United States Department of the Interior, Bureau of Land Management). 1980. Kanab/Escalante Grazing Management Final Environmental Impact Statement. BLM, Cedar City District, Cedar City, Utah.

______. 1981a. Paria Management Framework Plan. BLM, Kanab Resource Area, Cedar City District. April 22, 1981.

______. 1981b. Escalante Management Framework Plan. BLM, Escalante Resource Area, Cedar City District. April 22, 1981.

______. 1981c. Vermilion Management Framework Plan. BLM, Kanab Resource Area, Cedar City District. April 22, 1981.

______. 1981d. Zion Management Framework Plan. BLM, Kanab Resource Area, Cedar City District. April 22, 1981.

______. 1992. Manual 1745, Introduction, Transplant, Augmentation, and Reestablishment of Fish, Wildlife, and Plants. BLM, Washington, DC. March 26, 1992.

______. 1997. BLM Utah Standards for Rangeland Health{ XE "Rangeland Health" } and Guidelines for Livestock Grazing Management. Internet website: http://www.blm.gov/ut/st/en/fo/vernal/grazing_/rangeland_ health_standards.html.

______. 1999. Escalante Management Framework Plan Approved Amendment and Record of Decision. BLM Utah State Office, Salt Lake City. March 15, 1999.

______. 2000. Grand Staircase-Escalante National Monument Management Plan{ XE "Monument Management Plan, Grand Staircase-Escalante National Monument (MMP 2000)" } and Record of Decision. BLM, Grand Staircase-Escalante National Monument, Cedar City, Utah. February 2000.

______. 2001. Handbook H-4180-1, Rangeland Health{ XE "Rangeland Health" } Standards. BLM, Washington Office, Washington, DC. January 19, 2001.

BLM GIS. 2014. Base GIS data on file with BLM's eGIS Server, used for calculations or figures to support the MMP{ XE "Monument Management Plan, Grand Staircase-Escalante National Monument (MMP 2000)" }-A. BLM, Grand Staircase Escalante National Monument, Utah.

NPS (United States Department of the Interior, National Park Service). 1979. Glen Canyon National Recreation Area Proposed General Management Plan{ XE "General Management Plan, Glen Canyon (GMP 1979)" }, Wilderness Recommendation, and Road Study Alternatives Final Environmental Impact Statement. Glen Canyon National Recreation Area, Page, Arizona.

______. 1999. Glen Canyon National Recreation Area Grazing Management Plan{ XE "Grazing Management Plan, Glen Canyon (GzMP 1999)" } and Finding of No Significant Impact. NPS, Glen Canyon National Recreation Area, Page, Arizona. August 1999.

______. 2006. Management Policies. US Department of the Interior, National Park Service. ISBN 0-16-076874-8.

Pellant, M., P. Shaver, D. A. Pyke, and J. E. Herrick. 2005. Interpreting indicators of rangeland health{ XE "Rangeland Health" }, version 4. Technical Reference 1734-6. US Department of the Interior, Bureau of Land Management, National Science and Technology Center, Denver, Colorado. BLM/WO/ST-00/001+1734/REV05.

This page intentionally left blank.

Executive Summary

TABLE OF CONTENTS

Chapter | Page

TABLES

Page

FIGURES

Page

This page intentionally left blank.

ES. Executive Summary

[= Gill Sans MT / 11pt / bold / Small Caps / Title Case / exactly 14pt line spacing / no indentation]

DO NOT DELETE THIS PAGE from the MS Word file, as this is what marks Heading 1 for the table of contents. (Do delete this page later from the Adobe Acrobat [pdf] file.)

THROW THIS PAGE AWAY & DELETE FROM PDF

EXECUTIVE SUMMARY

ES.1 INTRODUCTION

Commented [kk1]: Reminder: most of the language in the Exec Sum is pulled from other chapters, so changes here should be tracked through to those chapters as well

The US Department of the Interior (DOI), Bureau of Land Management (BLM), Grand Staircase-Escalante National Monument (GSENM), as the lead agency, has prepared this draft Environmental Impact Statement (EIS) and Livestock Grazing Management Plan{ XE "Grazing Management Plan, Glen Canyon (GzMP 1999)" } Amendment (MMP{ XE "Monument Management Plan, Grand Staircase-Escalante National Monument (MMP 2000)" }-A). It is a guide for managing BLM lands in GSENM, as well as lands for which GSENM has administrative responsibility for livestock grazing, specifically portions of the BLM's Kanab Field Office (KFO) and Arizona Strip Field Office (ASFO) and National Park Service (NPS)-managed lands in Glen Canyon National Recreation Area (Glen Canyon).

The approved MMP{ XE "Monument Management Plan, Grand Staircase-Escalante National Monument (MMP 2000)" }-A will amend the 2000 GSENM Management Plan (MMP) (BLM 1999) to incorporate management of livestock grazing, and will supersede the existing Escalante, Paria, Vermillion, and Zion regional management framework plans (MFP) signed in 1981 (BLM 1981a, 1981b, 1981c, and 1981d) and a subsequent plan amendment of the Escalante MFP completed in 1999 (BLM 1999), under which livestock grazing in GSENM is currently administered. Information about the MMP-A/EIS can be obtained on the project website at https://eplanning.blm.gov/epl-front-office/eplanning/planAndProjectSite.do?methodName=renderDefaultPlanOrProjectSite&projectId=69026.

The land use planning process is the key tool the BLM uses to manage resources and to designate uses on the lands it administers, in coordination with tribal, other federal, state, and local governments, land users, and interested members of the public. This MMP{ XE "Monument Management Plan, Grand Staircase-Escalante National Monument (MMP 2000)" }-A has been prepared using BLM planning regulations and guidance issued under the authority of the Federal Land Policy and Management Act{ XE "Federal Land Policy and Management Act (FLPMA)" } (FLPMA) of 1976 (43 US Code [USC], Section 1701 et seq.) and the BLM's Land Use Planning Handbook, H-1601-1 (BLM 2005), as amended. An EIS is incorporated into this document to meet the requirements of the National Environmental Policy Act{ XE "National Environmental

Policy Act (NEPA)" } of 1969 (NEPA), Council on Environmental Quality{ XE "Council on Environmental Quality (CEQ)" } (CEQ) regulations for implementing NEPA (40 Code of Federal Regulations [CFR], Parts 1500-1508), DOI NEPA regulations (43 CFR, Part 46), and the requirements of the BLM's NEPA Handbook, H-1790-1 (BLM 2008).

The planning area encompasses approximately 2,316,100 acres in Garfield and Kane Counties, Utah, and Coconino County, Arizona. The planning area includes all BLM-managed lands in GSENM and BLM- and NPS-managed lands for which GSENM has livestock grazing administration responsibility. This includes lands in portions of the BLM's KFO and ASFO and NPS-managed lands in Glen Canyon.

The planning area is bordered on the west by Bryce Canyon National Park and the BLM KFO, on the north by Dixie National Forest, on the east by Capitol Reef National Park and Glen Canyon, and on the south by the BLM's KFO and ASFO, Utah State and Institutional Trust Lands, and Glen Canyon. Small areas of state, municipal, and private lands are contained within the planning area (see **Figure ES-1**~~**Figure ES-1**~~, Planning Area~~Planning Area~~).

The BLM's decision area for this planning effort is all of the BLM grazing lands that GSENM administers, including some lands in the BLM's KFO and ASFO; the NPS decision area is lands in Glen Canyon where GSENM administers grazing permits{ XE "Permit, Grazing" }. The decision area totals approximately 2,242,000 acres in the planning area but does not include state, municipal, or private lands, or small areas of BLM-managed land where no grazing decisions have previously been made or are being made in the MMP{ XE "Monument Management Plan, Grand Staircase-Escalante National Monument (MMP 2000)" }-A. **Table ES-1**, Land Status, shows acres by landowner or land management agency in the planning area and the decision area.

Table ES-1
Land Status

Landowner/Management Agency	Acres
Planning Area	
BLM	1,934,800
NPS	318,800
State	19,900
Private	42,600
Total	***2,316,100***
Decision Area	
BLM, GSENM	1,855,400
BLM, Kanab Field Office	65,500
BLM, Arizona Strip Field Office	2,300
NPS, Glen Canyon	318,800
Total	***2,242,000***

Source: BLM GIS 2014
Note: Acres have been rounded to the nearest 100.

There are 96 allotments in the decision area, 20 of which (approximately 318,800 acres) are wholly or partially in Glen Canyon (see **Figure ES-2**~~**Figure ES-2**~~, Livestock Grazing

Allotments). The BLM administers the permits on these allotments, in accordance with the enabling legislation for Glen Canyon and by means of a memorandum of understanding and interagency agreement between the BLM and the NPS.

Figure ES-1 Planning Area

Figure ES-2 Livestock Grazing Allotments

Twenty allotments (65,500 acres) are wholly or partially in the BLM's KFO; the Sink Holes allotment (2,300 acres) is partially in the BLM's ASFO. GSENM has decision-making authority for allocation decisions related to these allotments and also administers the permits, in conformance with the land use plans for those offices. In other words, the only decisions in this MMP-A that apply to the KFO and ASFO are the allocation decisions related to allotments that are available or unavailable for livestock grazing. The BLM Arizona Strip Field Office administers the Rock Reservoir and Coyote allotments in GSENM (see Figure ES-2~~Figure ES-2~~).

ES.2 Purpose of and Need for the Monument Management Plan{ XE "Monument Management Plan, Grand Staircase-Escalante National Monument (MMP 2000)" } Amendment

This MMP{ XE "Monument Management Plan, Grand Staircase-Escalante National Monument (MMP 2000)" }-A is needed to integrate livestock grazing and rangeland management into the existing MMP. It also provides for the comprehensive, science-based management of livestock grazing that enables multiple use/sustained yield of renewable resources by maintaining or improving land health. Land use plan decisions are needed to identify the lands available for livestock grazing, the amount of forage available for livestock, and possible grazing management practices, such as grazing systems, range improvements{ XE "Range Improvement" } (including land treatments), seasons of use, and stocking rates{ XE "Stocking Rate" } (BLM 2005).

Updated land use plan decisions for livestock grazing are also needed to incorporate new information and the many changes that have occurred since the 1980s. Livestock grazing decisions for GSENM must follow Proclamation 6920, which created the National Monument.

The purposes of this MMP{ XE "Monument Management Plan, Grand Staircase-Escalante National Monument (MMP 2000)" }-A are as follows:

- Establish goals and objectives for livestock grazing and rangeland management
- Establish broad-scale decisions that set the stage for site-specific implementation decisions, such as timing (season of use), duration (length of time), frequency of livestock grazing (how often), and magnitude (number of animal unit months (AUMs)) of livestock grazing
- Identify where grazing uses are allowed, restricted, or prohibited (i.e., available or unavailable for livestock grazing)
- Identify grazing management practices
- Provide the land use plan level decisions needed to integrate livestock and rangeland management with the management of GSENM objects and other resources.

For the decision area in Glen Canyon, the MMP{ XE "Monument Management Plan, Grand Staircase-Escalante National Monument (MMP 2000)" }-A ensures that the BLM's administration of grazing permits{ XE "Permit, Grazing" } protects the park resources and values{ XE "Resources and Values (Glen Canyon)" } of Glen Canyon in accordance with the NPS Organic Act of 1916 (54 USC, Section 100101). It provides that the BLM accomplish the goals and objectives defined in the 1979 Glen Canyon National Recreation Area General Management Plan{ XE "General Management Plan, Glen Canyon (GMP 1979)" } (GMP), the Glen Canyon

Grazing Management Plan{ XE "Grazing Management Plan, Glen Canyon (GzMP 1999)" } (GzMP){ XE "Grazing Management Plan, Glen Canyon (GzMP 1999)" }, and other applicable land use plans. These goals and objectives are in place to protect park resources and to avoid unacceptable impacts or impairment.

The purposes for Glen Canyon are the same as those for GSENM, with decisions to be made by the NPS in accordance with applicable laws and policy.

ES.3 Scoping{ XE "Scoping" }

Scoping{ XE "Scoping" }, as required by 40 CFR, Subpart 1501.7, is an early and open process for determining the scope of issues to be addressed and identifying the significant issues related to a proposed action. Information collected during scoping may also be used to develop the alternatives to be addressed in an EIS.

The intent of scoping is to focus the analysis on significant issues and reasonable alternatives, to eliminate extraneous discussion, and to reduce the length of the EIS (BLM 2008).

The BLM published a Notice of Intent to prepare the GSENM Livestock Grazing MMP{ XE "Monument Management Plan, Grand Staircase-Escalante National Monument (MMP 2000)" }-A/EIS on November 4, 2013 (78 Federal Register 66064-66065). This initiated the formal public scoping period, which ended on January 13, 2014, 30 days after the last public scoping meeting. The public scoping period lasted 70 days, more than double the minimum required for BLM land use planning. The BLM published a public scoping report on the project website (https://eplanning.blm.gov/epl-front-office/eplanning/planAndProjectSite.do?methodName=renderDefaultPlanOrProjectSite&projectId=69026). In addition to the comments documented in the scoping report, the BLM will consider all comments received during the planning process when developing the MMP-A.

Public scoping activities included the following:

- The BLM created and is maintaining a project website (https://eplanning.blm.gov/epl-front-office/eplanning/planAndProjectSite.do?methodName=renderDefaultPlanOrProjectSite&projectId=69026) to keep the public informed about the MMP{ XE "Monument Management Plan, Grand Staircase-Escalante National Monument (MMP 2000)" }-A/EIS process.
- In November 2013, the BLM mailed a newsletter, announcing the public scoping period, to more than 350 individuals, agencies, and organizations. It provided project background information, the dates and venues for three scoping meetings, decisions to be made, a planning timeline, preliminary planning criteria{ XE "Planning Criteria" } and planning issues{ XE "Planning Issues" }, and a description of the various methods for submitting comments, including dedicated e-mail and postal mail addresses.
- The BLM sent a press release announcing the scoping period to local media outlets and posted it on the project website on November 1, 2013. The press release provided the dates and locations of the scoping meetings and described the various methods for submitting comments. The press release was published on KCSG

Television's website on November 1, 2013, in the Wayne & Garfield County Insider on December 5, 2013, and in Deseret News on December 6, 2013. Additionally, "The County Seat," a television program, ran a piece explaining the planning and the implications of changes to grazing on ranchers and counties.

- The BLM hosted three scoping meetings to provide the public with opportunities to become involved, to learn about the project and the planning process, to meet the GSENM MMP{ XE "Monument Management Plan, Grand Staircase-Escalante National Monument (MMP 2000)" }-A/EIS team members, and to offer comments. The meetings occurred on December 10, 11, and 12, 2013, in Kanab, Escalante, and Salt Lake City, Utah. The meetings were advertised via press release, the project newsletter, the project website, and phone calls from BLM staff to potentially interested grazing permit{ XE "Permit, Grazing" }tees.
- The NPS and BLM participated in open houses to share information on the GSENM MMP{ XE "Monument Management Plan, Grand Staircase-Escalante National Monument (MMP 2000)" }-A and other NPS planning in Page, Arizona, and Blanding, Escalante, Kanab, and Salt Lake City, Utah, in February 2014.
- The BLM received 564 written submissions during the public scoping period, comprising 205 separate submissions, and 1 form letter. Most written submissions included more than one comment, so the 564 submissions (including form letters) yielded 1,287 discrete comments. Detailed information about the comments received and about the public outreach process can be found in the GSENM Scoping{ XE "Scoping" } Report, available on the project website (https://eplanning.blm.gov/epl-front-office/eplanning/planAndProjectSite.do?methodName=renderDefaultPlanOrProjectSite&projectId=69026).

~~The BLM received 564 written submissions during the public scoping period, comprising 205 separate submissions, and one form letter. Most written submissions included more than one comment, so the 564 submissions (including form letters) yielded 1,287 discrete comments. Detailed information about the comments received and about the public outreach process can be found in the GSENM Scoping{ XE "Scoping" } Report, available on the project website (https://eplanning.blm.gov/epl-front-office/eplanning/planAndProjectSite.do?methodName=renderDefaultPlanOrProjectSite&projectId=69026).~~

ES.4.1 Issue Identification

Issue identification is the first step of the nine-step BLM planning process. A planning issue is a major controversy or dispute regarding management of resources or uses on BLM-administered lands that can be addressed in a variety of ways, which is within the BLM's authority to resolve. Planning issues{ XE "Planning Issues" } provide the major focus for development of alternatives.

ES.4.2 Issues Addressed

GSENM has identified the following planning issues to guide the development and comparison of alternatives:

- Effects of livestock grazing management on GSENM Proclamation-identified scientific and historical objects
- Lands available for livestock grazing in the decision area
- Effects of livestock grazing management on the resources and values{ XE "Resources and Values (Glen Canyon)" } for which Glen Canyon was established (e.g., public outdoor recreation use and enjoyment and scenic, scientific, and historical features)
- Forage{ XE "Forage" } currently available on an area-wide basis for livestock grazing and available for future anticipated demands
- Guidelines and criteria for future allotment-specific adjustments, such as the amount of forage available for livestock, season of use, or other grazing management practices
- Effects of livestock grazing management on local custom and culture{ XE "Custom and Culture" }
- Effects of livestock grazing management on the area's economy
- Management of existing range improvement{ XE "Range Improvement" } seedings{ XE "Seeding" } and opportunities for future range improvements
- Effects of livestock grazing management on vegetation, including riparian vegetation
- Effects of livestock grazing management on soils, including biological soil crusts{ XE "Biological Soil Crust" }
- Effects of climate change and drought on forage availability
- Effects of livestock grazing management on recreation
- Effects of livestock grazing on cultural resources

ES.4.3 Issues Considered but Not Further Analyzed

Approximately 10 percent of the comments received during the public scoping period concerned issues that are not addressed in this MMP{ XE "Monument Management Plan, Grand Staircase-Escalante National Monument (MMP 2000)" }-A. These include implementation decisions that the BLM has already addressed or implementation of the MMP-A, issues to be addressed through policy or administrative action, issues that the BLM has addressed but should be better communicated to those who raised the issues, comments related to laws, regulations, and guidance, and issues beyond the scope of the MMP-A. Specific issues considered but not further analyzed are provided in the scoping report on the project website (https://eplanning.blm.gov/epl-front-office/eplanning/planAndProjectSite.do?methodName=renderDefaultPlanOrProjectSite&projectId=69026).

ES.5 Planning Criteria{ XE "Planning Criteria" }

During its initial planning sessions and internal scoping, GSENM staff developed preliminary planning criteria{ XE "Planning Criteria" }, which establish limitations, guidelines, and standards for the planning process. Planning criteria define the scope of the amendment process and estimate the extent of data collection and analysis. These criteria are based on standards

prescribed by applicable laws and regulations, agency guidance, results of consultation and coordination with the public and other federal, state, and local agencies, analysis of information pertinent to the planning area, and professional judgment. The BLM may change planning criteria as a result of public input, as issues are addressed, or as new information is presented.

The BLM identified preliminary planning criteria{ XE "Planning Criteria" } in the Notice of Intent. Based on public comments and input from cooperating agencies, the BLM modified the preliminary planning criteria{ XE "Planning Criteria" } for use in preparing the Draft EIS/MMP{ XE "Monument Management Plan, Grand Staircase-Escalante National Monument (MMP 2000)" }-A, as follows:

- The BLM will limit the scope of the MMP-{ XE "Monument Management Plan, Grand Staircase-Escalante National Monument (MMP 2000)" }A to making land use-level planning decisions specific to livestock grazing.
- This MMP-{ XE "Monument Management Plan, Grand Staircase-Escalante National Monument (MMP 2000)" }A will address BLM- and NPS-managed lands, where GSENM administers grazing permits{ XE "Permit, Grazing" }.
- The BLM and NPS will administer grazing in Glen Canyon to protect its values and purposes, in accordance with Public Law 92-593 and the 1916 NPS Organic Act.
- The BLM will use the Utah BLM Standards for Rangeland Health{ XE "Rangeland Health" } and Guidelines for Livestock Grazing Management (BLM 1997) and will apply existing land health standards to all alternatives.[1]
- The approved MMP{ XE "Monument Management Plan, Grand Staircase-Escalante National Monument (MMP 2000)" }-A will comply with the FLPMA{ XE "Federal Land Policy and Management Act (FLPMA)" }, NEPA{ XE "National Environmental Policy Act (NEPA)" }, National Historic Preservation Act{ XE "National Historic Preservation Act (NHPA)" }, and CEQ{ XE "Council on Environmental Quality (CEQ)" } regulations at 40 CFR, Parts 1500-1508.
- The approved MMP{ XE "Monument Management Plan, Grand Staircase-Escalante National Monument (MMP 2000)" }-A will comply with 43 CFR, Part 1600, 43 CFR, Part 4100, the BLM Land Use Planning Handbook (BLM 2005), the 2008 BLM NEPA{ XE "National Environmental Policy Act (NEPA)" } Handbook (BLM 2008), and other applicable BLM regulations, policies, and guidance.
- Land use planning decisions for Glen Canyon will comply with applicable NPS management policies, director's orders, and reference manuals.
- Land use planning decisions must be consistent with the Presidential Proclamation for GSENM and with the enabling legislation for Glen Canyon.
- For NPS-managed lands, the BLM will apply to all alternatives the goals, objectives, and recommendations for grazing and management identified in the 1999 GzMP{ XE

[1]The Utah BLM Standards of Rangeland Health also apply to the portion of the ASFO where GSENM administers livestock grazing.

"Grazing Management Plan, Glen Canyon (GzMP 1999)" } for Glen Canyon; this is to ensure protection of park resources and values{ XE "Resources and Values (Glen Canyon)" }, as defined by the NPS. Any proposed updates or revisions to the GzMP goals, objectives, and recommendations for grazing management identified in this MMP{ XE "Monument Management Plan, Grand Staircase-Escalante National Monument (MMP 2000)" }-A will be specifically identified and described by alternative.

- The BLM will use an accepted input-output quantitative model, such as IMPLAN, for socioeconomic analysis.
- The BLM and NPS will review and use as appropriate current scientific information, research, technologies, and results of inventorying, monitoring, and coordinating to inform management strategies. The use of scientific and scholarly information will be consistent with Department of Interior Manual 305 DM 3.
- The BLM and NPS will coordinate and communicate with federal, state, local, and tribal governments to ensure that the BLM and NPS consider the provisions of pertinent plans and that it seek to resolve inconsistencies between federal, state, local, and tribal plans. The BLM and NPS will also provide ample opportunities for federal, state, local, and tribal governments to comment on amendment development.
- The BLM and NPS will base the MMP-{ XE "Monument Management Plan, Grand Staircase-Escalante National Monument (MMP 2000)" }A on the principles of adaptive management.

ES.6 Management Alternatives

Commented [BB2]: Much of the introductory language here was pulled from GJFO DEIS Exec Sum

The basic goal of developing alternatives is to prepare different approaches to address the identified major planning issues{ XE "Planning Issues" }. Alternatives must meet the purpose and need; be reasonable; be responsive to the issues; meet the established planning criteria{ XE "Planning Criteria" }; and meet federal laws, regulations, policies, and standards, including the GSENM Proclamation and the multiple use mandates of the FLPMA{ XE "Federal Land Policy and Management Act (FLPMA)" }.

Following the close of the public scoping period in January 2014, the BLM began developing a range of alternatives by assembling an interdisciplinary team of BLM resource specialists in GSENM based on the issues presented in the GSENM Livestock Grazing Plan Amendment EIS Scoping{ XE "Scoping" } Report, finalized in May 2014 (BLM 2014) and guided by established planning criteria{ XE "Planning Criteria" }. Five preliminary alternatives were developed in close coordination with the cooperating agencies (see **Section 5.3.1**, Cooperating Agencies).

The preliminary alternatives proposed different scenarios for managing livestock and rangelands in the planning area. Planning issues{ XE "Planning Issues" } raised during scoping and addressed in the alternatives are general livestock grazing topics, livestock grazing management practices, livestock grazing forage availability and allocation, and rangeland health{ XE "Rangeland Health" }. The BLM made the preliminary draft alternatives publicly available in December 2014. Public comments received on the preliminary alternatives were included in the Preliminary Alternatives Comment Report, finalized in June 2016 (BLM 2016). Based on comments received, the BLM

revised the preliminary alternatives and announced the selection of five alternatives for detailed study in the MMP{ XE "Monument Management Plan, Grand Staircase-Escalante National Monument (MMP 2000)" }-A in a June 2016 newsletter.

Each alternative stands alone as a potential MMP{ XE "Monument Management Plan, Grand Staircase-Escalante National Monument (MMP 2000)" }-A and provides direction for livestock grazing management based on the development of specific goals, objectives, and management actions. Described in each alternative is specific direction influencing land management. Livestock grazing uses not tied to planning issues{ XE "Planning Issues" } or mandated by laws or regulations often contain few or no differences in management between alternatives. Alternatives may also result in different long-term conditions.

Each alternative varies in its response to the planning issues{ XE "Planning Issues" }, providing a range of possible management approaches that the BLM could implement, along with the outcomes of those approaches. Distinctions between alternatives are expressed in the EIS by varying specific objectives, allowable uses, and management actions. Although each alternative stands alone as a potential MMP{ XE "Monument Management Plan, Grand Staircase-Escalante National Monument (MMP 2000)" }-A, the Proposed MMP-A/Final EIS may include elements from multiple alternatives analyzed in this draft.

Summaries of the alternatives are presented below. A complete description of all decisions proposed for each alternative is included in **Chapter 2**, Alternatives. **Table ES-2**, Summary Comparison of Alternatives, highlights the meaningful differences among alternatives.

ES.6.1 Alternative A—No Action

Commented [kk3]: Get from Chapter 2

Alternative A is the No Action Alternative and is a continuation of the current management direction contained in the 2000 GSENM MMP{ XE "Monument Management Plan, Grand Staircase-Escalante National Monument (MMP 2000)" }, the four 1981 BLM MFPs (BLM 1981a, 1981b, 1981c, 1981d), and the 1999 Glen Canyon GzMP{ XE "Grazing Management Plan, Glen Canyon (GzMP 1999)" } (NPS 1999). Existing policy and guidance such as regulations (specifically 43 CFR Part 4100, Grazing Administration), BLM Manuals, and NPS Director's Orders will also be followed.

Livestock grazing would continue at the existing permitted levels. Areas that are currently closed to livestock grazing would remain unavailable to livestock grazing. Areas that are currently unallotted (available for grazing but there is no current permitted grazing use) would remain available for livestock grazing. The three reserve common allotments{ XE "Reserve Common Allotment" } would also remain available for use as needed and when authorized.

For GSENM, land use plan decisions for livestock grazing beginning on page 40 of the MMP{ XE "Monument Management Plan, Grand Staircase-Escalante National Monument (MMP 2000)" } would be retained. For allotments in the planning area, the allocation decisions made in the Escalante, Paria, Vermilion, and Zion MFPs (BLM 1981a, 1981b, 1981c, 1981d) and the 1999 livestock grazing amendment to the MFPs (BLM 1999) would be retained. Grazing on the Glen Canyon portion of the planning area would continue to be governed by its 1999 GzMP{ XE "Grazing Management Plan, Glen Canyon (GzMP 1999)" } (NPS 1999).

Land use plan decisions from the six existing land use plans mentioned above have been reorganized to follow the general format in the BLM Land Use Planning Handbook (H-1601-1). Not all existing land use plan decisions readily fit into the goals, objectives, allowable uses, and management action categories described in the handbook. The interdisciplinary team used some judgment to place existing decisions into the four categories. Where there are any discrepancies, the original plan-level document should be used.

Of the 106,202 AUMs that are currently permitted, 29,245 are suspended{ XE "Suspension" }. The suspension of these AUMs is primarily the result of allotment land health evaluations, changes in allotment management, and allocation adjustments made during the establishment of allotment management plans{ XE "Allotment Management Plan" } or other planning efforts conducted for allotments now administered by GSENM. These suspensions primarily occurred by decisions prior to establishment of GSENM.

During the permit renewal process, BLM regulations allow for active AUMs to be decreased and placed in suspension{ XE "Suspension" } on grazing permits{ XE "Permit, Grazing" }. This would be the case if monitoring data were to indicate that the provisions for land health standards are not being achieved and on completion of the appropriate level of analysis. Conversely, if the provisions of land health standards are being achieved and an appropriate level of analysis indicates additional AUMs are available, suspended AUMs may be reactivated during this same permit renewal process. The EIS for this MMP{ XE "Monument Management Plan, Grand Staircase-Escalante National Monument (MMP 2000)" }-A does not consider suspended AUMs in the analysis of the action alternatives environmental consequences. This is because the level of analysis used at the land use planning level for allotment level decisions and their reactivation is not reasonably foreseeable. This is demonstrated by the current average actual use of 41,343 AUMs.

ES.6.2 Alternative B—No Grazing

This alternative would discontinue livestock grazing in GSENM and Glen Canyon. In addition, livestock grazing would be discontinued in allotments in the Kanab (KFO) and Arizona Strip (ASFO) Field Offices where GSENM has livestock grazing administration responsibility. Permittees would be given two years' notification prior to the cancellation of permits (43 CFR 4110.4-2(b)) and would be provided reasonable compensation for improvements placed or constructed by the permittee (43 CFR 4120.3-6(c)). Vegetation treatments{ XE "Vegetation Treatment" } for the purposes of improving land health, wildlife habitat, or natural communities, reducing weeds, or stabilizing cultural sites may still occur per existing decisions in the MMP{ XE "Monument Management Plan, Grand Staircase-Escalante National Monument (MMP 2000)" } (BLM 2000) and Glen Canyon GMP{ XE "General Management Plan, Glen Canyon (GMP 1979)" } (NPS 1979). Nonstructural range improvements{ XE "Range Improvement" } would not be maintained for livestock forage. Structural range improvements will be evaluated and removed as necessary to meet objectives for natural and cultural resources.

No monitoring of impacts from livestock grazing would be needed. While opportunities for science and research related to active grazing would be lost, there could be research associated with the effects of not grazing. The unavailable lands could act as ecological reference areas for comparable regions outside of GSENM and Glen Canyon.

ES.6.3 Alternative C—Reduced Grazing

This alternative emphasizes management that prioritizes native species diversity and ecological processes. Protection of Monument objects and resources and protection of park resources and values{ XE "Resources and Values (Glen Canyon)" } would be a priority. Livestock grazing would be managed to ensure reduced impact on resources. A variety of ungrazed reference areas would be established. Changes in grazing systems (e.g., season of use, intensity, and rotation) would be considered first before implementing nonstructural range improvements{ XE "Range Improvement" }. Areas currently unavailable and unallotted would remain unavailable for livestock grazing. Additional areas are identified as unavailable based on resource concerns (see **Table 2-2**, Rationale for Unavailable Allotments). Monitoring would occur specific to Goals and Objectives found in Alternative C, in addition to requirements for BLM Utah Rangeland Health{ XE "Rangeland Health" } Standards. As under Alternative A, AUMs in a suspended use category may be returned to active use during permit renewal, if monitoring demonstrates that the range can support reactivating suspended AUMs.

This alternative would reduce grazing to below average actual use, which is 41,343 AUMs based on a 19-year average (1996-2014). There are several allotments that would be unavailable under this alternative where the permittee currently takes nonuse in most years, which contributes to an average actual use that is much lower than active use, which is 76,957 AUMs.

ES.6.4 Alternative D—Increased Grazing

This alternative is derived from the Utah Escalante Region Grazing Zone (UCA 63J-8-105.8) and similar land use ordinances and county resource management plans in Garfield and Kane Counties (e.g., Kane County Land Use Ordinance Chapter 27, Multiple Functions/Multiple Use Grazing Zone). It includes preserving the history, culture, custom, and values of the family ranching industry while emphasizing an improved landscape to maintain a wide variety of beneficiaries.

The goal is to provide for an optimum level of livestock grazing and attainment of healthy rangelands, drought-resilient landscapes, and multiple beneficiaries. It would actively promote improving land health, including developing and maintaining nonstructural range improvements{ XE "Range Improvement" }, restoring sagebrush/grassland ecosystems, controlling noxious and invasive plants{ XE "Invasive Species" }, and controlling pinyon/juniper where livestock grazing occurs. It would promote maintenance of existing range improvements and would allow for construction of new range improvements, such as water development, fence repairs, fence installation, the use of machinery, and vehicle access for range improvements.

This alternative incorporates innovative, adaptive, livestock management practices and allows for on-site grazing management research. AUMs in a suspended{ XE "Suspension" } use category would be returned to active use during permit renewal; the overall number of AUMs would be increased. In this alternative, GSENM would be used as a laboratory for innovative grazing techniques.

The improvement of rangeland conditions would be expedited, to remain consistent with ordinances and local plans. Some unallotted and unavailable allotments would be made available for livestock grazing.

ES.6.5 Alternative E—BLM and NPS Preferred

This alternative emphasizes multiple use and sustained yield through grazing management designed to ensure that BLM Utah Rangeland Health{ XE "Rangeland Health" } Standards are achieved and land health is maintained or improved. Livestock grazing would be managed consistent with the Proclamation in GSENM. Nonstructural range improvements{ XE "Range Improvement" } would be managed for both ecosystem processes and forage production. As under Alternative A, AUMs in a suspended use category may be returned to active use during permit renewal if monitoring demonstrates that the range can support reactivating suspended AUMs. The alternative also clarifies certain aspects of existing management decisions for vegetation that are related to livestock grazing. In this alternative, GSENM would be used as a laboratory for innovative grazing techniques.

ES.7 Environmental Consequences

The purpose of the environmental consequences analysis in this MMP{ XE "Monument Management Plan, Grand Staircase-Escalante National Monument (MMP 2000)" }-A/EIS is to determine the potential for significant impacts of the federal action on the human environment. CEQ{ XE "Council on Environmental Quality (CEQ)" } regulations for implementing NEPA{ XE "National Environmental Policy Act (NEPA)" } states that "human environment" is interpreted comprehensively to include the natural and physical environment and the relationship of people with the environment (40 CFR, Part 1508.14). The "federal action" is the BLM's selection of an MMP-A on which future livestock grazing decisions will be based for GSENM.

Chapter 4, Environmental Consequences, objectively evaluates the likely direct, indirect, and cumulative impacts on the human and natural environment in terms of environmental, social, and economic consequences that are projected to occur from selecting the alternatives. Some types of impacts for resources or resource uses could be confined to decision area lands, whereas some actions may have off-site/indirect impacts on resources or other land jurisdictions (e.g., private or state lands). The impact analysis identifies both enhancing and improving effects on a resource from management actions, as well as those that have the potential to diminish resource values.

Table ES-3~~Table ES-3~~, Comparative Summary of Environmental Consequences, highlights the differences in impacts under the alternatives.

[redacted]

Table ES-2
Summary Comparison of Alternatives

	Alternative A	Alternative B	Alternative C	Alternative D	Alternative E
Theme	Continue current management direction. Livestock grazing continues at current permitted levels. Areas currently closed remain unavailable to grazing.	Discontinue livestock grazing in the decision area, including GSENM and Glen Canyon, with 2-year notification. Permittees provided compensation for improvements.	Emphasize native species diversity. Livestock grazing managed or discontinued to reduce conflicts to resources. Changes in grazing systems (e.g., season of use, intensity, and rotation) considered before implementing range improvements{ XE "Range Improvement" }. Provide large ungrazed reference areas.	Emphasize healthy landscapes to support multiple uses. Derived from State and County ordinances and plans. Livestock management promotes land health through adaptive management principles and innovative livestock practices. Some unavailable allotments become available and suspended{ XE "Suspension" } AUMs are returned to active use during permit renewal.	Emphasize sustainable yield through livestock management designed to ensure BLM Utah Rangeland Health{ XE "Rangeland Health" } Standards are achieved, as well as other applicable criteria on NPS-managed lands, and land health is improved. Provide for reserve common allotments.
Area and AUMs Available for Grazing					
Total Available (acres)	2,089,000	0	1,619,700	2,135,200	2,065,300
Available (acres)	2,074,400	0	1,619,700	2,135,200	2,045,800
Reserve Common Allotment (acres)	14,600	0	0	0	19,500
Active AUMs	76,957	0	63,144	107,955	76,520

(b)(5) DPP

[redacted]

Table ES-2
Summary Comparison of Alternatives

	Alternative A	Alternative B	Alternative C	Alternative D	Alternative E
Suspended AUMs	29,245	0	29,245	0	29,245
Maximum Permitted AUMs[1]	106,202{ XE "Suspension" }	0	92,389{ XE "Suspension" }	107,955[2]	105,765{ XE "Suspension" }
Average Actual Use AUMs[3]	41,343	0	33,368	42,885	40,100
Acres available per active AUM	27	0	26	20	27
Acres available per AUM, based on average actual use	51	0	49	50	52
Area (acres) Unavailable for Grazing					
Total Unavailable:	153,000	2,242,000	622,300	106,800	176,700
Trailing Only:{ XE "Trailing Only" }	15,700	0	15,200	0[4]	15,200
Glen Canyon unavailable:	88,700 Includes all or portions of Big Bowns Bench, Escalante River, Harvey's Fear, Navajo Bench, Rock Creek-Mudholes, and	318,800 (all allotments)	150,200 Includes all or portions of Big Bowns Bench, Escalante River, Fortymile Ridge, Harvey's Fear, Lake, Lower Warm Creek,	90,300 Includes all or portions of Big Bowns Bench, Escalante River, Harvey's Fear, Navajo Bench, Spencer Bench, and Unallotted	95,300 Includes all or portions of Big Bowns Bench, Escalante River, Harvey's Fear, Lake, Navajo Bench, Rock Creek-Mudholes, Spencer

[1] For Alternative A, "Maximum Permitted AUMs" reflects the total number of permitted AUMs under the existing MFPs, as amended. For Alternative D, this row is the total number of permitted AUMs under the existing MFPs, as amended, plus AUMs associated with newly available allotments or pastures. For Alternatives C and E, this row is current permitted use less the number of AUMs associated with unavailable allotments or pastures under the alternative.
[2] Currently suspended{ XE "Suspension" } AUMs would be restored at permit renewal.
[3] Average actual use is based on a 19-year average for Alternative A. For the other alternatives, this row is an estimate, based on current average actual use and changes in AUMs associated with areas available and unavailable for grazing. For analysis, the average actual use is assumed to remain static over the life of the plan. Average actual use is provided for comparison only and is not a planning-level decision.
[4] Trailing would be allowed under Alternative D; however, the zero in the column indicates that there are no allotments that would be restricted to trailing only{ XE "Trailing Only" }.

[redacted]

Table ES-2
Summary Comparison of Alternatives

	Alternative A	Alternative B	Alternative C	Alternative D	Alternative E
	Spencer Bench		Navajo Bench, Rock Creek-Mudholes, Spencer Bench, and Unallotted areas in Glen Canyon	areas in Glen Canyon	Bench, and Unallotted areas in Glen Canyon
Nonstructural Range Improvements{ XE "Range Improvement" **} GSENM**	Maintain and/or restore with native and nonnative species consistent with MMP{ XE "Monument Management Plan, Grand Staircase-Escalante National Monument (MMP 2000)" } and BLM Manual 1745.	Restore with native species consistent with MMP{ XE "Monument Management Plan, Grand Staircase-Escalante National Monument (MMP 2000)" } and BLM Manual 1745.	Maintain and/or restore with native species consistent with MMP{ XE "Monument Management Plan, Grand Staircase-Escalante National Monument (MMP 2000)" } and BLM Manual 1745.	Maintain and/or restore with native and nonnative species; allow new seedings{ XE "Seeding" } using native and nonnative plants consistent with BLM Manual 1745.	Maintain and/or restore with native and nonnative species consistent with BLM Manual 1745.
	Follow MMP.{ XE "Monument Management Plan, Grand Staircase-Escalante National Monument (MMP 2000)" }	Same as Alternative A.	Passive restoration and non-chemical methods will be the priority for preventing the introduction, establishment, and/or spread of noxious weeds{ XE "Noxious Weed" } and/or nonnative, invasive species.{ XE "Invasive Species" }	Where not otherwise constrained by special designations, allow a variety of vegetation restoration methods, including mechanical, chemical, biological, and prescribed fires.	Same as Alternative D.
	Livestock grazing after native seedings{ XE "Seeding" } are	N/A	Livestock grazing after native seeding{ XE "Seeding" }	Same as Alternative E.	After disturbance, modify livestock grazing practices until

[redacted]

(b)(5) DPP

Table ES-2
Summary Comparison of Alternatives

	Alternative A	Alternative B	Alternative C	Alternative D	Alternative E
	established will be modified to ensure the survival of the native plants. The livestock exclusion period required to allow establishment of seeded native species and recovery of surviving plants after a wildfire may be more than two years. Site evaluation will be required to determine when the native seedings should be grazed again and the effectiveness of the current or new grazing system on the persistence of native plants.		restoration will be modified to ensure the survival of the native plants. Post-disturbance, suspend livestock grazing for at least two growing seasons or until the majority of native plant species in the area have seeded, whichever is longer. Site evaluation will be required to determine when the native seedings should be grazed again and the effectiveness of the current or new grazing system on the persistence of native plants.		seedings{ XE "Seeding" } are established in order to promote the survival of plants. Generally, areas will be rested from livestock grazing for two growing seasons or until site objectives are met. Site evaluation will be required to determine when objectives for the seedings are met and grazing can be resumed.
Nonstructural Range Improvements{ XE "Range Improvement" **} Glen Canyon**	Nonstructural range improvements{ XE "Range Improvement" } and land treatments are not appropriate in Glen Canyon. Management-ignited fires will only be allowed for special	Same as Alternative A.	Same as Alternative A.	Same as Alternative A.	Same as Alternative A.

FOIA001:01673143

(b)(5) DPP

[redacted]

Table ES-2
Summary Comparison of Alternatives

	Alternative A	Alternative B	Alternative C	Alternative D	Alternative E
	circumstances, such as to control potentially new invasive exotic species.{ XE "Exotic Species" }				
Structural Range Improvement{ XE "Range Improvement" **} GSENMs: General** *(includes, but not limited to, fences, cattle guards, corrals, and cabins)*	Authorize structural range improvements{ XE "Range Improvement" } outlined in the MFPs within constraints of the MMP.{ XE "Monument Management Plan, Grand Staircase-Escalante National Monument (MMP 2000)" }	Evaluate structural range improvements{ XE "Range Improvement" } associated with livestock grazing for utility, historical significance, or other purposes and remove unless needed to meet objectives for natural and cultural resources.	Authorize structural range improvements{ XE "Range Improvement" } consistent with the MMP.{ XE "Monument Management Plan, Grand Staircase-Escalante National Monument (MMP 2000)" }	Authorize structural range improvements{ XE "Range Improvement" }. Maintain structural range improvements{ XE "Range Improvement" } so that forage reserves will be ready for use when needed.	Authorize structural range improvements{ XE "Range Improvement" } consistent with the MMP.{ XE "Monument Management Plan, Grand Staircase-Escalante National Monument (MMP 2000)" }
Structural Range Improvements{ XE "Range Improvement" **} Glen Canyon: General**	New line cabins (i.e., cabins) are not appropriate in Glen Canyon.		Same as Alternative A.	New line cabins would be considered within Glen Canyon outside of proposed wilderness areas. Proposals would be evaluated on a case-by-case basis via an appropriate NEPA{ XE "National Environmental Policy Act (NEPA)" } and National Historic	Same as Alternative D.

DOI-2019-10 02269

[redacted]

Table ES-2
Summary Comparison of Alternatives

	Alternative A	Alternative B	Alternative C	Alternative D	Alternative E
				Preservation Act{ XE "National Historic Preservation Act (NHPA)" } process.	
Structural Range Improvements{ XE "Range Improvement" **}** **GSENM: Water** *(includes pipelines, troughs, detention and retention ponds, drainage ditches)*	Water developments can be used as a management tool throughout the Monument for the following purposes: 1) Better distribution of livestock when deemed to have an overall beneficial effect on Monument resources, including water sources or riparian areas{ XE "Riparian Area" }, or to restore or manage native species or populations. 2) They can be done only when NEPA{ XE "National Environmental Policy Act (NEPA)" } analysis determines this tool to be the best means of achieving the above objectives and when		Where water developments are necessary for livestock grazing and protection of Monument objects, such developments will: 1) Be fenced and will protect associated wetland/{ XE "Wetland" }riparian resources. 2) On/off valves will ensure that water remains in its natural course/site at all times livestock are not present in the allotment/pasture. 3) Float valves would be used during the grazing season.	Authorize water developments for the following purposes: 1) Better distribution of livestock when deemed to have an overall beneficial effect on Monument resources, including water sources or riparian areas{ XE "Riparian Area" }, or to restore or manage native species or populations. 2) They can be done only as a means of achieving MMP{ XE "Monument Management Plan, Grand Staircase-Escalante National Monument (MMP 2000)" } objectives and only when the water development would not dewater streams or springs.{ XE "Spring" } 3)	Same as Alternative D.

[redacted]

Table ES-2
Summary Comparison of Alternatives

	Alternative A	Alternative B	Alternative C	Alternative D	Alternative E
	the water development would not dewater streams or springs.{ XE "Spring" } 3) Developments will not be permitted to increase overall livestock numbers. 4) Maintenance of existing development can continue, but may require NEPA analysis and must be consistent with objectives of this plan.			Exceptions would be allowed on a temporary basis such as to fill troughs or storage tanks.	
Structural Range Improvements{ XE "Range Improvement" **} Glen Canyon: Water**	All water developments must consider the needs of wildlife and recreation and will not be constructed, maintained, or utilized in such a way as to preclude the access to that source by wildlife or recreation users. When grazing permits{ XE "Permit, Grazing" } are canceled or modified	Evaluate structural range improvements{ XE "Range Improvement" } associated with livestock grazing for utility, historical significance, or other purposes and remove unless needed to meet objectives for natural and cultural resources.	New water developments would be considered within Glen Canyon outside of the proposed wilderness area. Proposals would be evaluated on a case-by-case basis via an appropriate NEPA{ XE "National Environmental Policy Act (NEPA)" } and National Historic Preservation Act{ XE "National Historic	Same as Alternative C.	Same as Alternative C.

FOIA001:01673143

[redacted]

Table ES-2
Summary Comparison of Alternatives

	Alternative A	Alternative B	Alternative C	Alternative D	Alternative E
	for other than public purposes, existing range improvements{ XE "Range Improvement" } will be evaluated for abandonment or removal. Removal may be completed by the benefitting party, owner, or agency.		Preservation Act (NHPA)" } process.		
Season of Use GSENM	Manage season of use to meet BLM Utah Rangeland Health{ XE "Rangeland Health" } Standards.	N/A	Adaptively manage season of use, duration, distribution, and stocking rate{ XE "Stocking Rate" } (AUMs) of livestock grazing to ensure that Goals and Objectives are met. When grazing occurs during the growing season, ~~at a minimum~~ there will be a minimum 6 weeks~~s~~ deferment between the date of when grazing use begins one year and the date of when grazing use begins the following year. If this is not	Adaptively manage season of use, duration, distribution, and stocking rate{ XE "Stocking Rate" } (AUMs) to meet BLM Utah Rangeland Health{ XE "Rangeland Health" } Standards. Allow flexibility in permit for season of use (i.e., manage for conditions rather than calendar dates).	Adaptively manage season of use, duration, distribution, and stocking rate{ XE "Stocking Rate" } (AUMs) to meet BLM Utah Rangeland Health{ XE "Rangeland Health" } Standards and reduce conflicts with other resources and uses.

(b)(5) DPP

DOI-2019-10 02272

[redacted]

Table ES-2
Summary Comparison of Alternatives

	Alternative A	Alternative B	Alternative C	Alternative D	Alternative E
			possible in a particular area, the area will be rested every other year. During winter grazing, use rest rotation and do not graze an area more than ~~two~~ 2 out of ~~three~~ 3 years.		
			Change season of use where livestock grazing overlaps with high use and/or high value recreation areas.		
			Change season of use for grazing as appropriate for biological soil crust{ XE "Biological Soil Crust" } and soil site degradation susceptibility so that grazing does not occur during times when crusts are most susceptible to damage.		
			Change season of use in allotments with known locations of Ute ladies' tresses so		

[redacted]

(b)(5) DPP

Table ES-2
Summary Comparison of Alternatives

	Alternative A	Alternative B	Alternative C	Alternative D	Alternative E
			that cattle are not present during sensitive seasons.		
			Change season of use, duration, distribution, and/or stocking rate{ XE "Stocking Rate" } (AUMs) if monitoring for biological soil crust{ XE "Biological Soil Crust" } indicates more than a moderate departure from reference.		
Season of Use Glen Canyon	Follow Glen Canyon GzMP{ XE "Grazing Management Plan, Glen Canyon (GzMP 1999)" } (1999) – see spring{ XE "Spring" } grazing seasons.	N/A	Adaptively manage season of use, duration, and stocking rate{ XE "Stocking Rate" } (AUMs) of livestock grazing to ensure that NPS Goals and Objectives are met.	Adaptively manage season of use, duration, and stocking rate{ XE "Stocking Rate" } (AUMs) to meet Glen Canyon resource objectives as defined by the NPS Grazing Plan. Allow flexibility in permit for season of use (i.e., manage for conditions rather than calendar dates). Use BLM Utah Rangeland Health{ XE "Rangeland Health" } Standards as	Same as Alternative C.

(b)(5) DPP

[redacted]

Table ES-2
Summary Comparison of Alternatives

	Alternative A	Alternative B	Alternative C	Alternative D	Alternative E
				supplement to GzMP{ XE "Grazing Management Plan, Glen Canyon (GzMP 1999)" } Goals and Objectives with actions triggered if these drop below Slight-Moderate in three categories; use long-term monitoring plots to determine trend.	
Riders	Riders are an available tool, but no specific action is identified.	N/A	Where allotments are not meeting or moving toward objectives, a rider will be present five out of every seven days throughout the season of use.	Same as Alternative A.	Same as Alternative A.
Voluntary Relinquishment *(see* ***Figure 2-1****, Voluntary Relinquishment Decision Tree)*	• Comply with BLM policy for voluntary relinquishment (currently Instruction Memorandum No. 2013-184). The Authorized Officer may take one or more of the following actions:	N/A	Same as Alternative A.		

[redacted]

Table ES-2
Summary Comparison of Alternatives

	Alternative A	Alternative B	Alternative C	Alternative D	Alternative E
	• Issue a grazing permit{ XE "Permit, Grazing" } to a different applicant. • Stock with livestock from another allotment with unmet resource objectives. • Combine with an adjacent allotment that has unmet resource objectives. • Consider use of the allotment as a reserve common allotment{ XE "Reserve Common Allotment" } (i.e., continue livestock grazing but do not recognize an individual with preference to the forage). • Amend or revise the land use plan to allocate forage to uses other than livestock grazing. In other words, the				

[redacted]

(b)(5) DPP

Table ES-2
Summary Comparison of Alternatives

	Alternative A	Alternative B	Alternative C	Alternative D	Alternative E
	land use plan would be amended or revised to allocate the allotment as unavailable for livestock grazing.				
	N/A	N/A	Preference would be for amending the MMP{ XE "Monument Management Plan, Grand Staircase-Escalante National Monument (MMP 2000)" } to allocate forage for a different purpose. When voluntarily relinquished or otherwise retired, grazing preference{ XE "Preference, Grazing" } may be eliminated in allotments or pastures with Monument objects that are not compatible with or are impacted by livestock grazing (e.g., biological soil crust,{	Preference would be for one of the following: • Issue a grazing permit{ XE "Permit, Grazing" } to a different applicant. • Stock with livestock from another allotment with unmet resource objectives. • Combine with an adjacent allotment that has unmet resource objectives.	N/A

FOIA001:01673143

(b)(5) DPP

[redacted]

Table ES-2
Summary Comparison of Alternatives

	Alternative A	Alternative B	Alternative C	Alternative D	Alternative E
			XE "Biological Soil Crust" } riparian areas{ XE "Riparian Area" }, declining native plant or wildlife species) ~~may be eliminated~~.		
Biological Soil Crust and Soil Degradation Susceptibility	Prior to any ground-disturbing activity, the potential effects on biological soil crusts{ XE "Biological Soil Crust" } will be considered and steps taken to avoid impacts on their function, health, and distribution. Follow Glen Canyon GzMP.{ XE "Grazing Management Plan, Glen Canyon (GzMP 1999)" }	Same as Alternative A.	Biological soil crusts{ XE "Biological Soil Crust" } are protected from trampling and other physical disturbance within at least 60 percent of their predicted available habitat within GSENM and 80 percent within Glen Canyon.	Same as Alternative A.	*GSENM:* Same as Alternative A. *Glen Canyon:* Same as Alternative C.
	N/A	N/A	Pastures with more than 50 percent of soils with high soil degradation{ XE "Soil Degradation" } susceptibility would be unavailable for livestock grazing.	N/A	*GSENM:* N/A *Glen Canyon:* Same as Alternative C.

(b)(5) DPP

[redacted]

Table ES-2
Summary Comparison of Alternatives

	Alternative A	Alternative B	Alternative C	Alternative D	Alternative E
Science GSENM	Follow MMP.{ XE "Monument Management Plan, Grand Staircase-Escalante National Monument (MMP 2000)" } For full details on Science and Research guidance provided in the MMP, see pages 44-46 in the MMP.	Follow MMP;{ XE "Monument Management Plan, Grand Staircase-Escalante National Monument (MMP 2000)" } no opportunities to study active grazing. There would be research associated with the effects of not grazing. The unavailable lands could act as reference areas for similar ecological sites{ XE "Ecological Site" }.	Use science and research to: 1) gain an understanding of the impacts of livestock grazing in the decision area; 2) gain an understanding of the potential for movement of grazed areas toward reference conditions if ungrazed; and 3) distinguish climate impacts from livestock grazing impacts.	GSENM will serve as a laboratory to research innovative grazing techniques. Use science and research to gain an understanding of how to better achieve BLM Utah Rangeland Health{ XE "Rangeland Health" } Standards.	Follow MMP;{ XE "Monument Management Plan, Grand Staircase-Escalante National Monument (MMP 2000)" } GSENM will serve as a laboratory to research innovative grazing techniques and a diversity of grazing practices. Use science and research to gain an understanding of how to better achieve BLM Utah Rangeland Health{ XE "Rangeland Health" } Standards.
			Emphasize the use of large, ungrazed reference areas to provide reference states.	Allow experimental use of electric fences, other fence design, season of use, supplement/salt placement, water developments, and/or vegetation treatments{ XE "Vegetation Treatment" }, including prescribed	Encourage innovation and experimentation. Allow experimentation of grazing techniques and grazing practices to reduce impacts of livestock grazing on all lands available for livestock grazing.

[redacted]

Table ES-2
Summary Comparison of Alternatives

	Alternative A	Alternative B	Alternative C	Alternative D	Alternative E
				fire.	
			Monitor ungrazed reference areas to see how they respond under the management conditions of the decision area absent livestock grazing. Monitor reference areas to see how they move toward a reference state.	If ungrazed reference areas are established, do not exceed 0.5 percent in any allotment or 0.5 percent within GSENM. Allotments or pastures identified as unavailable for livestock grazing do not count toward the 0.5 percent cap within GSENM.	Use ungrazed reference areas to distinguish climate impacts from livestock grazing impacts.
Science Glen Canyon	Glen Canyon will use science-based information to protect park resources and values.	No similar action.	Use science and research to 1) gain an understanding of the impacts of livestock grazing in the decision area; 2) to gain an understanding of the potential for movement of grazed areas toward reference conditions if ungrazed; and 3) to distinguish climate impacts from livestock grazing impacts.	No similar action.	Same as Alternative C.

(b)(5) DPP

[redacted]

Table ES-2
Summary Comparison of Alternatives

	Alternative A	Alternative B	Alternative C	Alternative D	Alternative E
GSENM Objects{ XE "Objects (GSENM)" **}**	Manage livestock grazing in a manner consistent with the Proclamation. Follow MMP{ XE "Monument Management Plan, Grand Staircase-Escalante National Monument (MMP 2000)" } and BLM policy.	Livestock grazing would be discontinued; impacts would be eliminated.	Reduce livestock grazing in a manner that protects the objects identified in the Proclamation from impacts.	Same as Alternative A.	Same as Alternative A.
Glen Canyon Values and Purposes{ XE "Values and Purposes (Glen Canyon)" **}**	Manage livestock grazing in a manner that protects the values and purposes of Glen Canyon, including soil, vegetation, wildlife, special status species, cultural resources, water, paleontology, recreation, and scenic resources.	Livestock grazing would be discontinued; impacts would be eliminated.	Same as Alternative A.	Same as Alternative A.	Same as Alternative A.

(b)(5) DPP [redacted]

Table ES-3
Comparative Summary of Environmental Consequences

Alternative A (No Action) Resource or Resource Use	Alternative B	Alternative C	Alternative D	Alternative E
Livestock Grazing				
Under Alternative A, continuing to manage 2,089,200 acres as available to livestock grazing and 153,000 acres as unavailable to grazing would allow permitted grazing to continue at current levels (approximately 106,202 permitted AUMs, 76,957 of which are active). Average actual use would continue to be approximately 41,343 AUMs. Allowing structural range improvements{ XE "Range Improvement" } in GSENM and Glen Canyon and nonstructural range improvements in GSENM will continue to make forage available for livestock. No grazing permits would be cancelled under this alternative.	Discontinuing livestock grazing in the decision area would have the greatest impact on livestock grazing of any of the alternatives because there would be no more livestock grazing. All 136 grazing permits would be cancelled (a 100 percent decrease).	Under Alternative C, the BLM would reduce the acres available for grazing (a 22 percent reduction, compared with Alternative A). A maximum of 92,389 AUMs would be permitted (13 percent reduction from Alternative A); 63,144 of those AUMs would be active and 29,245 would be held in suspension{ XE "Suspension" }. The estimated average actual use would be 7,975 fewer AUMs. Reducing permitted AUMs could result in impacts on the ability of individual permittees and lessees to maintain operations, with a potential for economic impacts at the individual or community level. Alternative C would emphasize nonstructural range improvements{ XE "Range Improvement" } using native seed, as well as methods that minimize surface-disturbance. This could limit the amount of forage available for livestock if native seeds are not the best	Under Alternative D, the BLM would increase the acres available for grazing (two percent increase, compared with Alternative A). A maximum of 107,955 AUMs would be permitted (two percent increase from Alternative A due to restoring suspended{ XE "Suspension" } AUMs over time). However, the estimated average actual use would be 1,542 more AUMs. Alternative D allows for the implementation of additional areas of seedings{ XE "Seeding" } and vegetation treatments{ XE "Vegetation Treatment" } within GSENM. The resulting increase in forage capacity would help facilitate the reactivation of suspended{ XE "Suspension" } AUMs. No grazing permits would be cancelled. Permits could be authorized for previously unallotted or unavailable areas that are now available for livestock grazing.	Under Alternative E, the BLM would slightly decrease the acres available for grazing (a two percent reduction, compared with Alternative A). A maximum of 105,540 AUMs would be permitted (one percent reduction, compared with Alternative A); 76,295 of those AUMs would be active and 29,245 would be held in suspension{ XE "Suspension" }. Estimated average actual use would be 1,243 AUMs less than under Alternative A. The impacts from modifying livestock grazing practices following seed restoration would be the same as identified under Alternative A. Alternative E would provide greater flexibility to grazing permitt{ XE "Permit, Grazing" }ees than under Alternative A by allowing for the use of native or nonnative seeds (although prioritized with native first) in nonstructural range improvements{ XE "Range Improvement" }.

FOIA001:01673143

(b)(5) DPP

[redacted]

Table ES-3
Comparative Summary of Environmental Consequences

Alternative A (No Action)	Alternative B	Alternative C	Alternative D	Alternative E
		based on site type and needs. The number of grazing permits would decrease by 38 percent, as 52 permits would be cancelled.		One grazing permit would be cancelled, but permits could be authorized for the previously unavailable allotment that is now available for livestock grazing.
Vegetation				
Rocky Mountain Two-Needle Pinyon-Juniper Woodland, Great Basin and Intermountain Dry Shrubland and Grassland, and Barren NVCS macrogroups would have the greatest acreage available, representing 91, 92, and 82 percent, respectively, of the total acreage of those macrogroups in the decision area. Under Alternative A, 106,202 AUMs would be allocated for livestock~~, with 27 acres per AUM in active use~~. Nonnative species would not be used to increase forage for livestock in GSENM. This could hinder the ability to meet the BLM Utah Land Health Standards, if nonnative species could be used to stabilize soils in order to establish vegetative communities. No nonstructural range improvements would be	Discontinuing livestock grazing in the decision area would greatly reduce impacts on vegetation through passive and active restoration efforts. Only native species would be allowed to be used for restoration in GSENM, which could limit the potential for meeting BLM Utah Land Health Standards compared to Alternative A if native species are unavailable. No nonstructural range improvements{ XE "Range Improvement" } would be implemented in Glen Canyon, having impacts as described for Alternative A.	The reduction in acres available for grazing and AUMs, as well as changes in livestock management and the use of large, ungrazed reference areas, would reduce the impact of grazing on vegetation and improve the likelihood for meeting BLM Utah Land Health Standards in GSENM and Glen Canyon and additional NPS rapid assessment methods in Glen Canyon compared to Alternative A. Great Basin and Intermountain Dry Shrubland, Rocky Mountain Two-Needle Pinyon-Juniper Woodland, and Grassland, and Barren NVCS macrogroups would have the greatest acreage available, representing 79, 65, and 65 percent, respectively, of the total acreage of those macrogroups in the decision area.	Under Alternative D, the BLM would increase both the acres available for grazing (two percent increase, compared with Alternative A) and AUMs (two percent increase, compared with Alternative A). While there would be more acres available for livestock grazing and also more AUMs permitted than under Alternative A and although Alternative D would emphasize structural and nonstructural range improvements{ XE "Range Improvement" } that would better distribute livestock, the pattern of livestock use is still likely to be similar to current distribution. Therefore, because more livestock would be on the landscape, there is an increased likelihood that grazing would impact vegetation, making it increasingly difficult to meet BLM Utah Rangeland Health{	Reductions in the acres available for grazing and AUMs would reduce the impact of grazing on vegetation in areas that would be unavailable to grazing. However, the increase in density of AUMs would increase the impact in areas available to grazing. In areas available to grazing, this could reduce the likelihood for meeting BLM Utah Land Health Standards in GSENM and Glen Canyon and additional NPS rapid assessment methods in Glen Canyon compared to Alternative A. Rocky Mountain Two-Needle Pinyon-Juniper Woodland, Great Basin and Intermountain Dry Shrubland, and Grassland, and Barren NVCS macrogroups would have the greatest acreage available, representing 93, 92, and 83 percent, respectively,

DOI-2019-10 02283

FOIA001:01673143

[redacted]

(b)(5) DPP

Table ES-3
Comparative Summary of Environmental Consequences

Alternative A (No Action)	Alternative B	Alternative C	Alternative D	Alternative E
implemented in Glen Canyon, which would limit the potential for meeting BLM Utah Land Health Standards and additional NPS rapid assessment methods in this area.		Impacts from management of nonstructural range improvements{ XE "Range Improvement" } would be similar to those described for Alternative B. Under Alternative C, additional measures would be implemented to prevent nonnative invasive plants{ XE "Invasive Species" } from establishing or spreading. This would increase the likelihood of meeting BLM Utah Land Health Standards in GSENM and Glen Canyon and additional NPS rapid assessment methods in Glen Canyon compared to Alternative A.	XE "Rangeland Health" } Standards in GSENM and Glen Canyon and additional NPS desired vegetation standards in Glen Canyon, compared with Alternative A. Rocky Mountain Two-Needle Pinyon-Juniper Woodland, Great Basin and Intermountain Dry Shrubland, and Grassland, and Barren NVCS macrogroups would have the greatest acreage available, representing 97, 92, and 91 percent, respectively, of the total acreage of those macrogroups in the decision area. Despite ~~C~~changes in livestock management and the use of a variety of vegetation treatment{ XE "Vegetation Treatment" } methods~~,~~ due to the increase in acres available for grazing and AUMs under Alternative D, there is an increased likelihood that grazing would impact vegetation at a rate that would outpace the management to improve vegetation. Thus, it would be increasingly difficult to meet	of the total acreage of those macrogroups in the decision area. In addition, the BLM would increase the acreage managed as a reserve common allotment{ XE "Reserve Common Allotment" }, which would assist in land restoration efforts. Use of ungrazed reference areas would have impacts as described for Alternative C. Other impacts would be similar to those described for Alternative D.

DOI-2019-10 02284

[redacted]

Table ES-3
Comparative Summary of Environmental Consequences

Alternative A (No Action)	Alternative B	Alternative C	Alternative D	Alternative E
			~~reduce the impact of grazing on vegetation and improve the likelihood for meeting~~ BLM Utah Land Health Standards in GSENM and Glen Canyon and additional NPS rapid assessment methods in Glen Canyon compared to Alternative A. Similarly, the increase in acres available for grazing and active AUMs would likely cause impacts to vegetation that would outpace management that would allow new seedings and the use of native and nonnative species for nonstructural range improvements{ XE "Range Improvement" } in GSENM. Under this alternative, it would be more difficult to meet the BLM Utah Land Health Standards compared to Alternative A. Impacts in Glen Canyon would be the same as under Alternative A.~~Native and nonnative species would be used for nonstructural range improvements{ XE "Range Improvement" } in GSENM, which would help meet the BLM Utah Land Health~~	

(b)(5) DPP

[redacted]

Table ES-3
Comparative Summary of Environmental Consequences

Alternative A (No Action)	Alternative B	Alternative C	Alternative D	Alternative E
			~~Standards. In addition, new seedings would be allowed. Impacts in Glen Canyon would be the same as under Alternative A.~~	
Soil Resources				
Impacts on soil (such as sensitive soils and biological soil crusts{ XE "Biological Soil Crust" }) from livestock and livestock management involving surface disturbance, soil mixing, nutrient cycling, compaction, and authorized uses would continue, as described in Section 4.5.3 Nature and Type of Effects. There would continue to be 2,089,000 acres (93 percent of the decision area) available for livestock grazing. There are 1,276,000 acres (57 percent of the decision area) where livestock grazing (available for grazing, reserve common allotments{ XE "Reserve Common Allotment" }, and trailing) would continue to occur on sensitive soils (BLM GIS 2014). Impacts on soil from	Impacts on soil from structural and nonstructural range improvements{ XE "Range Improvement" } would occur, as described in Section 4.5.3 Nature and Type of Effects. There would be no livestock grazing under Alternative B; consequently, there would be no impacts on soil (including sensitive soils, early biological crust, and late biological crust aggregate) from livestock. Alternative B would have the least impacts on soil from livestock. Impacts on soil from structural and nonstructural range improvements{ XE "Range Improvement" } would still occur. In GSENM, the BLM would restore ranges with native species. In GSENM and Glen Canyon, structural range improvements may be	Impacts on soil (such as sensitive soils and biological soil crusts{ XE "Biological Soil Crust" }) from livestock and livestock management involving surface disturbance, soil mixing, nutrient cycling, compaction, and authorized uses would occur, as described in Section 4.5.3 Nature and Type of Effects. There would be 1,619,700 acres (72 percent of the decision area) available for livestock grazing. There would be 469,300 fewer acres (21 percent of the decision area) available for livestock grazing than under Alternative A. Compared with Alternative A, there would be fewer impacts on soil, because less area would be grazed. There are 1,010,300 acres (45 percent of the decision area)	Impacts on soil (such as sensitive soils and biological soil crusts{ XE "Biological Soil Crust" }) from livestock and livestock management involving surface disturbance, soil mixing, nutrient cycling, compaction, and authorized uses would occur, as described in Section 4.5.3 Nature and Type of Effects. There would be 2,135,200 acres (95 percent of the decision area) available for livestock grazing. There would be 46,200 more acres (2 percent of the decision area) available for livestock grazing than under Alternative A. Because more livestock would be on the landscape, there is an increased likelihood that grazing would impact soils, making it increasingly difficult to meet BLM Utah Rangeland Health{ XE "Rangeland	Impacts on soil (such as sensitive soils and biological soil crusts{ XE "Biological Soil Crust" }) from livestock and livestock management involving surface disturbance, soil mixing, nutrient cycling, compaction, and authorized uses would occur, as described in Section 4.5.3 Nature and Type of Effects. There would be 2,065,300 acres (91 percent of the decision area) available for livestock grazing. There would be 23,700 fewer acres (one percent of the decision area) available for livestock grazing than under Alternative A. Compared with Alternative A, there would be slightly fewer impacts on soil, because slightly less area would be grazed. The intensity of impacts would be about the same as under Alternative A.

FOIA001:01673143

[redacted]

Table ES-3
Comparative Summary of Environmental Consequences

Alternative A (No Action)	Alternative B	Alternative C	Alternative D	Alternative E
structural and nonstructural range improvements{ XE "Range Improvement" } would continue under current management. In GSENM, the BLM would maintain or restore ranges with native and nonnative species. However, nonstructural range improvements and land treatments are not appropriate in Glen Canyon. There are six livestock grazing allotments in the decision area that do not meet Standard 1, and livestock grazing was determined to be the cause on all six allotments. In these allotments, 379,400 acres (17 percent of the decision area) would continue to be available for livestock grazing (BLM GIS 2014). Since 2006, the BLM, in coordination with permittees, has made changes in the six allotments, resulting in progress toward meeting standards.	removed. There are six livestock grazing allotments in the decision area that do not meet Standard 1, and livestock grazing was determined to be the cause on all six allotments. Because livestock grazing would not occur, these six allotments have a higher potential for meeting Standard 1 more quickly under Alternative B than under Alternative A. Since 2006, the BLM, in coordination with permittees, has made changes in the six allotments, resulting in progress toward meeting standards. This trend would increase under Alternative B, because there would be no grazing to affect the allotments that do not meet Standard 1. However, the BLM would not have permittees with which to partner under this alternative.	where livestock grazing and trailing would occur on sensitive soils (BLM GIS 2014). Compared with Alternative A, the area where livestock activities would occur on sensitive soils would decrease by 12 percent of the decision area, thereby providing more protection to these soil types. Impacts on soil from structural and nonstructural range improvements{ XE "Range Improvement" } would occur. In GSENM, the BLM would maintain or restore ranges with native species. Passive restoration and non-chemical methods would be implemented. Compared with Alternative A, livestock grazing would be managed or discontinued to reduce conflicts with soil resources thereby minimizing impacts on soil, such as during critical times of the year. There are six livestock grazing allotments in the decision area that do not meet Standard 1, and livestock grazing was determined to be the cause	Health" } Standards compared with Alternative A. There are 1,319,600 acres (59 percent of the decision area) that would be available for livestock grazing on sensitive soils (BLM GIS 2014). Compared with Alternative A, the area where livestock activities would occur on sensitive soils would increase by two percent of the decision area, thereby increasing impacts on these soil types. Impacts on soil from structural and nonstructural range improvements{ XE "Range Improvement" } would occur. In GSENM, the BLM would maintain or restore ranges with native and nonnative species and would allow a variety of vegetation restoration methods. The BLM would maintain structural range improvements so that forage reserves would be ready for use when needed. In GSENM and Glen Canyon, the BLM and NPS would adaptively manage the season-of-use, duration, distribution, and	There are 1,273,700 acres (57 percent of the decision area) where livestock grazing activities (available for grazing, reserve common allotments{ XE "Reserve Common Allotment" }, and trailing) would occur on sensitive soils (BLM GIS 2014). The impacts would be similar to those under Alternative A, except unalloted acres in Alternative A would become unavailable for grazing under Alternative E. Impacts on soil from structural and nonstructural range improvements{ XE "Range Improvement" } would occur. In GSENM, the BLM would maintain or restore ranges with native and nonnative species and would allow a variety of vegetation restoration methods. The BLM would authorize structural range improvements consistent with the MMP or with the Kanab or Arizona Strip RMPs, where applicable{ XE "Monument Management Plan, Grand Staircase-Escalante

(b)(5) DPP

[redacted]

Table ES-3
Comparative Summary of Environmental Consequences

Alternative A (No Action)	Alternative B	Alternative C	Alternative D	Alternative E
		on all six allotments. Of these areas, livestock grazing would be available on 329,300 acres (14 percent of the decision area; BLM GIS 2014). Because livestock grazing would not occur in some allotments, these areas have a higher potential for meeting Standard 1 more quickly under Alternative C than under Alternative A.	stocking rate{ XE "Stocking Rate" }. In order to provide for the optimum level of livestock grazing and the attainment of healthy rangelands, Alternative D contains more structural and nonstructural range improvements than Alternative A. There are six livestock grazing allotments in the decision area that do not meet Standard 1, and livestock grazing was determined to be the cause on all six allotments. Of these areas, 396,200 acres (18 percent of the decision area) would continue to be available for livestock grazing (BLM GIS 2014). The impacts on soil would be similar to those under Alternative A, except for the additional 16,800 acres in Upper Paria that would be available under Alternative D for livestock grazing.	National Monument (MMP 2000)" }. Also in GSENM, the BLM would adaptively manage season of use, duration, distribution, and stocking rate{ XE "Stocking Rate" }. Additionally, nonstructural range improvements{ XE "Range Improvement" } would be managed both for ecosystem processes and forage production. Compared with Alternative A, Alternative E emphasizes multiple use and sustained yield through grazing management. It is designed to ensure that BLM Utah Rangeland Health{ XE "Rangeland Health" } Standards are achieved and that land health is improved. There are six livestock grazing allotments in the decision area that do not meet Standard 1, and livestock grazing was determined to be the cause on all six allotments. The impacts would be the same as those under Alternative D.
Water Resources				
Impacts on water from livestock and livestock	Impacts on water from structural and nonstructural	Impacts on water from livestock and livestock	Impacts on water from livestock and livestock	Impacts on water from livestock and livestock

(b)(5) DPP

[redacted]

Table ES-3
Comparative Summary of Environmental Consequences

Alternative A (No Action)	Alternative B	Alternative C	Alternative D	Alternative E
management involving sedimentation, contamination, and authorized uses would continue, as described in Section 4.6.3 Nature and Type of Effects. There would continue to be 2,089,000 acres (93 percent of the decision area) available for livestock grazing where impacts on water would occur. Impacts on water from structural and nonstructural range improvements{ XE "Range Improvement" } would continue from current management under Alternative A. In GSENM, the BLM would continue to use water developments as a management tool. Nonstructural range improvements and land treatments are not appropriate in Glen Canyon. In Glen Canyon, all water developments must consider the needs of wildlife and recreation. Livestock grazing would continue to be available on allotments containing 92.6	range improvements{ XE "Range Improvement" } would occur, as described in Section 4.6.3 Nature and Type of Effects. There would be no livestock grazing under Alternative B; consequently, there would be no impacts on water from livestock. Alternative B would have the least impacts on water from livestock. It is important to note, however, that livestock grazing would likely be replaced by other activities. Impacts on water from those activities would be speculative, because those activities are unknown at this time. Impacts on ~~soil~~ water from structural and nonstructural range improvements{ XE "Range Improvement" } would still occur. In GSENM, the BLM would restore ranges with native species. In GSENM and Glen Canyon, structural range improvements may be removed. Removing structural range improvements would restore the natural conditions of the	management involving sedimentation, contamination, and authorized uses would occur, as described in Section 4.6.3 Nature and Type of Effects. There would be 1,619,700 acres (72 percent of the decision area) available for livestock grazing where impacts on water would occur. Impacts on water from structural and nonstructural range improvements{ XE "Range Improvement" } would occur. In GSENM, where water developments are necessary for livestock grazing and protection of Monument objects, such developments would be managed. Also, new water developments would be considered within Glen Canyon outside of the proposed wilderness area. Compared with Alternative A, livestock grazing would be managed or discontinued to reduce conflicts to resources, including water resources. Changes in grazing systems would be taken into	management involving sedimentation, contamination, and authorized uses would occur, as described in Section 4.6.3 Nature and Type of Effects. There would be 2,135,200 acres (95 percent of the decision area) available for livestock grazing where impacts on water would occur. Impacts on water from structural and nonstructural range improvements{ XE "Range Improvement" } would occur. In GSENM, the BLM would authorize water developments for predetermined purposes. In GSENM, the BLM would allow experimental use of electric fences, other fence design, season of use, supplement and salt placement, water developments, and vegetation treatments{ XE "Vegetation Treatment" }, including prescribed fire. Also, new water developments would be considered within Glen Canyon, outside of the	management involving sedimentation, contamination, and authorized uses would occur, as described in Section 4.6.3 Nature and Type of Effects. There would be 2,065,300 acres (91 percent of the decision area) available for livestock grazing where impacts on water would occur. Impacts on water from structural and nonstructural range improvements{ XE "Range Improvement" } would occur. In GSENM, the BLM would authorize water developments for predetermined purposes. New water developments would be considered within Glen Canyon outside of the proposed wilderness area. Nonstructural range improvements{ XE "Range Improvement" } would be managed for both ecosystem processes and forage production. Compared with Alternative A, Alternative E emphasizes multiple use and sustained yield through

(b)(5) DPP

[redacted]

Table ES-3
Comparative Summary of Environmental Consequences

Alternative A (No Action)	Alternative B	Alternative C	Alternative D	Alternative E
miles of 303(d)-listed streams (BLM GIS 2014). Within allotments in the decision area that do not meet Standard 4, there would continue to be 543,000 acres (24 percent of the decision area) available for livestock grazing (BLM GIS 2014). Since 2006, the BLM, in coordination with permittees, has made changes in the six allotments, resulting in progress toward meeting standards.	ranges. It would allow natural soil conditions to develop over larger areas, thereby minimizing the transport of soil capable of affecting water quality and stream conditions. Compared with Alternative A, Alternative B would maintain or restore water conditions over a larger area. There would be 130.8 miles of 303(d)-listed streams on lands unavailable for livestock grazing (BLM GIS 2014). Compared with Alternative A, Alternative B would remove all livestock that contribute to water contamination, thereby increasing the opportunities for improved water quality and conditions. There would be no acres available for livestock grazing in allotments that do not meet Standard 4 (BLM GIS 2014). Compared with Alternative A, Alternative B would remove all livestock that affect an allotment being able to meet Standard 4, thereby increasing the opportunities for the allotment to meet Standard 4.	consideration before range improvements are implemented. This which would minimize impacts on water, such as during critical times of the year. Livestock grazing would occur in allotments available for grazing or trailing that contain 78.4 miles of 303(d)-listed streams (BLM GIS 2014). Compared with Alternative A, Alternative C would decrease livestock activities on allotments containing 14.2 miles of 303(d)-listed streams, thereby increasing the opportunities for improved water quality and conditions. Within allotments in the decision area that do not meet Standard 4, there would be 407,000 acres (18 percent of the decision area) available for livestock grazing (BLM GIS 2014). Compared with Alternative A, Alternative C would decrease the acres available for livestock grazing in these allotments by 136,000 acres (6 percent of the decision area). This would increase the opportunities for the areas to meet Standard 4.	proposed wilderness area. Livestock management would promote land health improvements, which would involve water resources. Management would also promote maintaining range improvements{ XE "Range Improvement" }. In order to provide for the optimum level of livestock grazing and the attainment of healthy rangelands, Alternative D contains more structural and nonstructural range improvements than Alternative A. Livestock grazing would be available on allotments containing 125.8 miles of 303(d)-listed streams (BLM GIS 2014). Compared with Alternative A, Alternative D would increase livestock grazing on allotments containing 33.2 miles of 303(d)-listed streams, thereby increasing the opportunities for livestock to alter water quality and conditions in these streams. Within allotments in the decision area that do not meet Standard 4, there would	grazing management. This is designed to ensure that BLM Utah Rangeland Health{ XE "Rangeland Health" } Standards are achieved and land health is improved. Livestock grazing would occur in allotments available for grazing or trailing that contain 106.9 miles of 303(d)-listed streams (BLM GIS 2014). Compared with Alternative A, Alternative E would increase livestock grazing on allotments containing 14.3 miles of 303(d)-listed streams, thereby increasing the opportunities for livestock to alter water quality and conditions for these streams. With respect to allotments in the decision area that do not meet Standard 4, the impacts would be similar to Alternative A, except the Rock Creek-Mudholes allotment (1,574 acres) would be a reserve common allotment{ XE "Reserve Common Allotment" } under Alternative E. This would increase the opportunities for the area to

[redacted]

Table ES-3
Comparative Summary of Environmental Consequences

Alternative A (No Action)	Alternative B	Alternative C	Alternative D	Alternative E
	more quickly than under Alternative A.	more quickly than under Alternative A.	be 543,400 acres (24 percent of the decision area) available for livestock grazing (BLM GIS 2014). The impacts on water would be similar to those under Alternative A, except for the additional 380 acres under Alternative D that would be available for livestock grazing in Rock Creek-Mudholes.	meet Standard 4, because it would likely be grazed less under Alternative E.

(b)(5) DPP

[redacted]

Table ES-3
Comparative Summary of Environmental Consequences

Alternative A (No Action)	Alternative B	Alternative C	Alternative D	Alternative E
Recreation				
There would continue to be the potential for livestock grazing to influence recreation setting characteristics and opportunities on 2,089,200 acres (93 percent) of the planning area managed as available for livestock grazing. ~~The average acreage per AUM would be 50.~~ The intensity of impacts would be in direct proportion to the density of grazing activity and number of recreationists in a given area. Accordingly, the greatest potential for impacts on recreation from grazing would be near popular recreation areas and trails frequently used by livestock. This would include the 935,600 acres of SRMAs{ XE "Special Recreation Management Area (SRMA)" } in GSENM. Alternative A would continue to provide visitors with opportunities to see livestock grazing on public lands. Grazing impacts on recreation settings and opportunities in the backcountry would be	There would be no livestock use under Alternative B, which would eliminate the potential for conflicts between recreation and livestock. Alternative B would also eliminate opportunities for visitors to experience cattle ranching activities. Removing structural range improvements{ XE "Range Improvement" } would eliminate the potential for those features to obstruct recreation access or modify recreation settings. Overall, there would be an increase in the quality and quantity of recreation opportunities in GSENM and Glen Canyon NRA, compared with Alternative A.	Managing 469,300 fewer acres as available for grazing compared with Alternative A, would reduce the overall area where grazing could conflict with recreation by 22 percent. In SRMAs{ XE "Special Recreation Management Area (SRMA)" }, there would be a 19 percent (177,700 acre) reduction in areas available for grazing. ~~There would be an average maximum density of 25 acres per AUM, which~~The decrease in AUMs would further reduce the potential for impacts on recreation settings and opportunities compared with Alternative A. It would also reduce opportunities for visitors to observe cattle grazing. In areas available for grazing, there would still be the potential for livestock to impact recreation settings and opportunities, particularly near popular recreation areas. Impacts from structural and nonstructural range	Alternative D would result in a 2 percent (46,200-acre) increase in the overall portion of the planning area where livestock grazing could conflict with recreation settings and opportunities compared with Alternative A. Increasing grazing in SRMAs{ XE "Special Recreation Management Area (SRMA)" } by 80,600 acres would affect recreation settings and opportunities, particularly in the Escalante Canyon and Paria-Hackberry SRMAs, the two most visited SRMAs in the planning area. Visitors would have slightly more opportunities to view livestock grazing, which may improve recreation experiences for some visitors. Impacts on recreation from the density of livestock would be the same as Alternative A. Structural and nonstructural range improvement{ XE "Range Improvement" } impacts on recreation would be similar to Alternative A, with the exception that new	There would be 23,700 (1 percent) fewer overall acres where livestock grazing would impact recreation compared with Alternative A. However, in SRMAs{ XE "Special Recreation Management Area (SRMA)" }, there would be a net 1,900 acres fewer acres in SRMAs available for grazing resulting in a slightly greater area where impacts on recreation from grazing could occur. The greatest potential for impacts would be in the Paria-Hackberry SRMA, where 16,800 additional acres would be available for grazing. Impacts from grazing density would be nearly the same as Alternative A as would visitors' opportunities to view livestock grazing on public lands. Impacts from structural and nonstructural range improvements{ XE "Range Improvement" } would be the same as Alternative A. Reducing or temporarily eliminating grazing from areas

(b)(5) DPP
[redacted]

Table ES-3
Comparative Summary of Environmental Consequences

Alternative A (No Action)	Alternative B	Alternative C	Alternative D	Alternative E
less frequent because fewer visitors would experience a change in their recreation setting or opportunity from grazing. However, visitors' encounters with livestock, manure, or range improvements{ XE "Range Improvement" } in the backcountry would result in a more intense impact on the recreation setting because the activity would contrast more sharply with the undeveloped recreation setting. Structural range improvements{ XE "Range Improvement" } would continue to influence the recreation setting and opportunities by modifying the visual setting and obstructing access to certain areas. At the same time, fences and other range improvements would prevent livestock from wandering onto roads, trails, and other areas where people recreate. Nonstructural range improvements{ XE "Range Improvement" }, such as reseeding, could displace		improvements{ XE "Range Improvement" } would be similar to Alternative A. Season of use management would rest allotments or reduce AUMs in certain areas to protect other resources. This would also reduce the potential for conflict with recreation uses, particularly during the late spring{ XE "Spring" } and summer.	line cabins in Glen Canyon could modify recreation setting characteristics. The potential for impacts would be greatest in remote areas where the cabins would contrast with the primitive recreation setting.	adjacent to Highways 12 and 89 would reduce conflicts in these areas but would also limit visitors' opportunities to observe grazing in GSENM. Adaptive management would reduce the potential for recreation conflicts, especially in or adjacent to high-use recreation areas.

[redacted]

Table ES-3
Comparative Summary of Environmental Consequences

Alternative A (No Action)	Alternative B	Alternative C	Alternative D	Alternative E
visitors in the short-term. In the long-term, restoration would improve the recreation setting and quality of recreation opportunities.				

(b)(5) DPP

[redacted]

Table ES-3
Comparative Summary of Environmental Consequences

Alternative A (No Action)	Alternative B	Alternative C	Alternative D	Alternative E
Air Quality and Climate Change				
Livestock grazing and its associated activities are not a significant source of air pollutant emissions in the planning area and would not impact air quality conditions over the long term. Structural improvements, vegetation treatments{ XE "Vegetation Treatment" }, and vehicle use would be short-term, direct sources of emissions. Grazing would be source of indirect particulate emissions resulting from surface disturbance and wind erosion. Over the long term, vegetation treatments{ XE "Vegetation Treatment" } would decrease the potential for fugitive particulate emissions from soil erosion, decrease susceptibility to wildfire, and increase carbon storage in soils and vegetation. Methane emissions from livestock grazing would be a small incremental source of greenhouse gas emissions (0.0001 percent of state	Livestock grazing would not occur under Alternative B, so there would be no direct impacts on air quality from that use. Exposed soils would continue to be a source of fugitive dust emissions until actively or passively restored. Eliminating livestock grazing would eliminate greenhouse gas emissions from this source in the decision area and would reduce greenhouse gas emissions, compared with Alternative A. In the planning area, greenhouse gas emissions from livestock grazing would remain the same, if livestock that historically grazed on decision area lands were shifted to lands outside of the decision area. Grazing is a small incremental source of greenhouse gas emissions in the planning area.	The types of direct and indirect impacts would be the same as described for Alternative A. Criteria pollutant{ XE "Criteria Pollutant" } emissions and greenhouse gas emissions would be less than under Alternative A. Alternative C would provide more protection to sensitive soil types and would decrease windblown particulate emissions compared to Alternative A. Carbon storage levels under Alternative C would likely increase compared to Alternative A. Greenhouse gas emissions from enteric fermentation would be similar to Alternative A and a small incremental source of greenhouse gas emissions.	The types of direct and indirect impacts would be the same as described for Alternative A. Alternative D would have slightly greater criteria pollutant{ XE "Criteria Pollutant" } and greenhouse gas emissions, compared with Alternative A. In addition, carbon storage levels under Alternative D would be similar to or slightly less than under Alternative A. Greenhouse gas emissions from enteric fermentation would be similar to Alternative A and a small incremental source of greenhouse gas emissions.	The types of direct and indirect impacts would be the same as described for Alternative A. Alternative E would have the same or slightly fewer criteria pollutant{ XE "Criteria Pollutant" } and greenhouse gas emissions, compared with Alternative A. In addition, carbon storage levels under Alternative E would likely be similar to or slightly more, compared with Alternative A. Greenhouse gas emissions from enteric fermentation would be similar to Alternative A and a small incremental source of greenhouse gas emissions.

FOIA001:01673143

(b)(5) DPP

[redacted]

Table ES-3
Comparative Summary of Environmental Consequences

Alternative A (No Action)	Alternative B	Alternative C	Alternative D	Alternative E
emissions [2011 levels]).				

[redacted]

Table ES-3
Comparative Summary of Environmental Consequences

Alternative A (No Action)	Alternative B	Alternative C	Alternative D	Alternative E
Fish and Wildlife				
Livestock grazing management would meet or move toward meeting Utah rangeland health{ XE "Rangeland Health" } standards. This requirement would ensure that components of fish and wildlife habitat like soils, vegetation, and wetland{ XE "Wetland" } and riparian areas{ XE "Riparian Area" } are maintained in the long term. Nonstructural range improvements{ XE "Range Improvement" } (mechanical, prescribed fire, chemical) would continue to be implemented, and may temporarily impact fish and wildlife species by displacement or short term reduction in habitat quality. In the long term, fish and wildlife habitat would be improved. Structural range improvements{ XE "Range Improvement" } (fencing, water developments) would impact fish and wildlife habitat in the short term by disturbing soils and increasing	Since there would be no livestock grazing under Alternative B, impacts on fish and wildlife would be limited to those from removing structural range improvements{ XE "Range Improvement" } and restoring nonstructural range improvements consistent with the MMP{ XE "Monument Management Plan, Grand Staircase-Escalante National Monument (MMP 2000)" }. Impacts would be similar to those under Alternative A but would be greatly reduced.	Impacts on fish and wildlife habitat from meeting or moving toward Utah rangeland health{ XE "Rangeland Health" } standards would be as described under Alternative A. Managing large ungrazed reference areas under Alternative C would generally result in reduced impacts compared to Alternative A. Nonstructural range improvements{ XE "Range Improvement" } would emphasize native plant species, passive restoration, and non-chemical treatments. Short term impacts on fish and wildlife species would be reduced compared to Alternative A, but long term habitat improvement would progress more slowly. Impacts from structural range improvements{ XE "Range Improvement" } would be the same as described under Alternative A.	Impacts on fish and wildlife habitat from meeting or moving toward Utah rangeland health{ XE "Rangeland Health" } standards would be as described under Alternative A. Fewer limits on nonstructural range improvements{ XE "Range Improvement" } like aerial chemical spraying and prescribed fire under Alternative D would increase short term impacts on fish and wildlife species compared to Alternative A. The resulting long term habitat improvements would be similar to Alternative A. Impacts from structural range improvements{ XE "Range Improvement" } would be the same as described under Alternative A. Slightly more acres of big game habitat would be available to livestock grazing compared to Alternative A, somewhat increasing impacts. Impacts from long term	Impacts on fish and wildlife habitat from meeting or moving toward Utah rangeland health{ XE "Rangeland Health" } standards would be as described under Alternative A. Fewer limits on nonstructural range improvements{ XE "Range Improvement" } like aerial chemical spraying and prescribed fire under Alternative E would increase short term impacts on fish and wildlife species compared to Alternative A. However, emphasizing and perpetuating native seed use in treatments would increase fish and wildlife habitat quality in the long term compared to Alternative A. Impacts from structural range improvements{ XE "Range Improvement" } would be the same as described under Alternative A. Slightly fewer acres of big game habitat would be available to livestock grazing

[redacted]

Table ES-3
Comparative Summary of Environmental Consequences

Alternative A (No Action)	Alternative B	Alternative C	Alternative D	Alternative E
potential for weed establishment and spread, but would improve habitat in the long term by protecting sensitive habitat like wetlands{ XE "Wetland" } and riparian areas{ XE "Riparian Area" }. Most big game habitat would continue to be available for livestock grazing. Impacts could include altered forage availability and competition for forage, habitat avoidance, and habitat fragmentation. Alternatively, habitat quality would be improved by nonstructural range improvements{ XE "Range Improvement" } in the long term, and water developments may provide increased water availability.		Fewer acres of big game habitat would be available to livestock grazing compared to Alternative A, reducing impacts. However, fewer nonstructural range improvements{ XE "Range Improvement" } and water developments would limit habitat quality improvement in the long term compared to Alternative A.	habitat quality increases and water availability would be similar to those described under Alternative A.	compared to Alternative A, somewhat reducing impacts. Impacts from long term habitat quality increases and water availability would be similar to those described under Alternative A.
Special Status Species				
Livestock grazing management would meet or move toward meeting Utah rangeland health{ XE "Rangeland Health" } standards. This requirement would ensure that special status species are maintained at an appropriate level as indicated by population numbers, habitat	Since there would be no livestock grazing under Alternative B, impacts on special status species would be limited to those from removing structural range improvements{ XE "Range Improvement" } and restoring nonstructural range improvements consistent with	Impacts on special status species from meeting or moving toward Utah rangeland health{ XE "Rangeland Health" } standards would be as described under Alternative A. Managing large ungrazed	Impacts on special status species from meeting or moving toward Utah rangeland health{ XE "Rangeland Health" } standards would be as described under Alternative A. Mexican spotted owl critical	Impacts on special status species from meeting or moving toward Utah rangeland health{ XE "Rangeland Health" } standards would be as described under Alternative A. Mexican spotted owl critical

FOIA001:01673143

(b)(5) DPP

[redacted]

Table ES-3
Comparative Summary of Environmental Consequences

Alternative A (No Action)	Alternative B	Alternative C	Alternative D	Alternative E
connectivity, and habitat improvement. 95 percent of critical habitat and all PACs{ XE "Protected Activity Center (PAC)" } for Mexican spotted owl, and all critical habitat for southwestern willow flycatcher~~, and 97 percent of greater sage-grouse{ XE "Greater Sage-Grouse" } PHMA{ XE "Priority Habitat Management Area (PHMA)" }~~ would continue to be available for livestock grazing. 88 percent of riparian habitat for listed riparian birds would be available. 97 percent of greater sage-grouse{ XE "Greater Sage-Grouse" } PHMA{ XE "Priority Habitat Management Area (PHMA)" } would continue to be available for livestock grazing. All occupied Kodachrome bladderpod habitat and nearly all Jones' cycladenia habitat would be available; however, since Jones' cycladenia grows on livestock-inaccessible	the MMP{ XE "Monument Management Plan, Grand Staircase-Escalante National Monument (MMP 2000)" }. Impacts would be similar to those under Alternative A but would be greatly reduced.	reference areas under Alternative C would generally result in reduced impacts compared to Alternative A. 76 percent of critical habitat and 60 percent of PAC{ XE "Protected Activity Center (PAC)" } acreage for Mexican spotted owl, 9 percent of critical habitat for southwestern willow flycatcher~~, and 97 percent of greater sage-grouse{ XE "Greater Sage-Grouse" } PHMA{ XE "Priority Habitat Management Area (PHMA)" }~~ would continue to be available for livestock grazing. 66 percent of riparian habitat for listed riparian birds would be available. Acres of greater sage-grouse{ XE "Greater Sage-Grouse" } PHMA{ XE "Priority Habitat Management Area (PHMA)" } available to livestock grazing would be the same as described under Alternative A, however, 41 percent fewer AUMs would be available, reducing impacts compared to Alternative A.	habitat and PACs{ XE "Protected Activity Center (PAC)" } and southwestern willow flycatcher critical habitat, and greater sage-grouse{ XE "Greater Sage-Grouse" } PHMA{ XE "Priority Habitat Management Area (PHMA)" } available under Alternative D would be nearly the same as under Alternative A. 95 percent of riparian habitat for listed riparian birds would be available, increasing impacts compared to Alternative A. Impacts on Kodachrome bladderpod, Jones' cycladenia, and Ute ladies'-tresses would be the same as described under Alternative A. Fewer limits on nonstructural range improvements{ XE "Range Improvement" } like aerial chemical spraying and prescribed fire under Alternative D would increase short term impacts on special status species compared to Alternative A. The resulting long term habitat improvements would be	habitat and PACs{ XE "Protected Activity Center (PAC)" } and southwestern willow flycatcher critical habitat~~, and greater sage-grouse{ XE "Greater Sage-Grouse" } PHMA{ XE "Priority Habitat Management Area (PHMA)" }~~ available under Alternative E would be nearly the same as under Alternative A. 90 percent of riparian habitat for listed riparian birds would be available, increasing impacts compared to Alternative A. Acres of greater sage-grouse{ XE "Greater Sage-Grouse" } PHMA{ XE "Priority Habitat Management Area (PHMA)" } available to livestock grazing would be the same as described under Alternative A, however, 29 percent fewer AUMs would be available, reducing impacts compared to Alternative A. Impacts on Kodachrome bladderpod, Jones' cycladenia, and Ute ladies'-tresses would be the same as described under Alternative A.

DOI-2019-10 02299

(b)(5) DPP [redacted]

Table ES-3
Comparative Summary of Environmental Consequences

Alternative A (No Action)	Alternative B	Alternative C	Alternative D	Alternative E
slopes, no impacts would occur. All known Ute ladies'-tresses locations would be similarly available. Nonstructural range improvements{ XE "Range Improvement" } would continue to occur and may displace or disrupt breeding for special status wildlife, or result in special status plant mortality if conducted in suitable habitat. Structural range improvements{ XE "Range Improvement" } in riparian areas{ XE "Riparian Area" } may similarly displace or disrupt listed riparian bird species in the short term but would result in long term habitat improvements. Livestock grazing may provide periodic cattle carcass forage opportunities for California condor.		Impacts on Kodachrome bladderpod, Jones' cycladenia, and Ute ladies'-tresses would be the same as described under Alternative A. Nonstructural range improvements{ XE "Range Improvement" } would emphasize native plant species, passive restoration, and non-chemical treatments. Short term impacts on special status species would be reduced compared to Alternative A, but long term habitat improvement would progress more slowly. Impacts from structural range improvements{ XE "Range Improvement" } would be the same as described under Alternative A. Because fewer acres would be available and fewer AUMs allocated to livestock grazing, cattle carcass forage opportunities for California condor would be reduced compared to Alternative A.	similar to Alternative A. Impacts from structural range improvements{ XE "Range Improvement" } would be the same as described under Alternative A. Impacts on California condor from cattle carcass forage availability would be the same as described under Alternative A.	Fewer limits on nonstructural range improvements{ XE "Range Improvement" } like aerial chemical spraying and prescribed fire under Alternative E would increase short term impacts on special status species compared to Alternative A. However, emphasizing and perpetuating native seed use in treatments would increase habitat quality in the long term compared to Alternative A. Impacts from structural range improvements{ XE "Range Improvement" } would be the same as described under Alternative A. Because fewer acres would be available and fewer AUMs allocated to livestock grazing, cattle carcass forage opportunities for California condor would be reduced compared to Alternative A.
Cultural Resources				
Combined with acres available for grazing and	Alternative B would be expected to reduce grazing-	Alternative C would be expected to reduce grazing-	Alternative D would likely have grazing-related impacts	Alternative E could result in a slight decrease of grazing-

[redacted]

Table ES-3
Comparative Summary of Environmental Consequences

Alternative A (No Action)	Alternative B	Alternative C	Alternative D	Alternative E
structural and nonstructural range improvements{ XE "Range Improvement" }, Alternative A would be expected to continue to result in both direct and indirect adverse effects. However, they may be minimized with the adoption of the Cultural Resources Management Protocol (**Appendix C**).	related impacts or adverse effects on historic properties throughout the decision area, when compared with Alternative A. However, removing range improvements{ XE "Range Improvement" } could involve ground-disturbing activities, which may impact historic properties, either directly or indirectly. In addition, if a cultural landscape, TCP{ XE "Traditional Cultural Property (TCP)" }, or other historic property, where ranching is a core element of its historic significance, were to be defined and eligible for listing on the NRHP{ XE "National Register of Historic Places (NRHP)" }, certain actions could be considered an adverse effect under Section 106 of the NHPA{ XE "National Historic Preservation Act (NHPA)" }. An example of these actions is removing ranching from the decision area, along with cattle, stock tanks, windmill-pump waters, fence lines, corrals, trails, and	related impacts or adverse effects on historic properties throughout the decision area, when compared with Alternative A. However, potential structural and nonstructural range improvements{ XE "Range Improvement" } associated with Alternative C involving ground-disturbing activities, fire, and herbicides may impact historic properties, either directly or indirectly. Potential direct and indirect impacts or adverse effects under Alternative C may be minimized with the adoption of the Cultural Resources Management Protocol (**Appendix C**).	or adverse effects on historic properties throughout the decision area that would be similar to those under Alternative A. However, some sites now protected from grazing impacts would be open to grazing under Alternative D. Therefore, they could be open to new grazing-related impacts not experienced under Alternative A. Potential direct and indirect impacts or adverse effects under Alternative D may be minimized with the adoption of the Cultural Resources Management Protocol (**Appendix C**).	related impacts or adverse effects on historic properties throughout the decision area, when compared with Alternatives A. Potential direct and indirect impacts or adverse effects under Alternative E may be minimized with the adoption of the Cultural Resources Management Protocol (**Appendix C**).

(b)(5) DPP

[redacted]

Table ES-3
Comparative Summary of Environmental Consequences

Alternative A (No Action)	Alternative B	Alternative C	Alternative D	Alternative E
	other ranching-related resources.			
Paleontological Resources				
In general, no impacts on paleontological resources{ XE "Paleontological Resource" } are anticipated as a result of Alternative A. Fossil resources in bluff shelters and coves do occur, albeit extremely rare, and nearly all the fossils are coprolite deposits. Possible mitigation measures are to place physical grazing exclosures around such sites or to amend allotments to keep livestock out of the sensitive areas.	No grazing-related impacts to paleontological resources{ XE "Paleontological Resource" } would occur under Alternative B.	Same as Alternative A.	Same as Alternative A.	Same as Alternative A.
Visual and Scenic Resources				
Some nonstructural and structural range improvements{ XE "Range Improvement" }, if designed and implemented properly, could meet the objectives of all BLM VRM classes. However, there are other improvements that would not meet the objectives, especially those objectives for preserving the existing character of the landscape and those for primarily	Under Alternative B, livestock grazing would be discontinued so there would be no impacts on visual resources from new structural or nonstructural range improvements{ XE "Range Improvement" } in GSENM or Glen Canyon. Removing range improvements{ XE "Range Improvement" } and implementing any necessary reclamation would remove	Because livestock grazing would decrease under this alternative, there would likely be less of a need for new structural and nonstructural range improvements{ XE "Range Improvement" }. Impacts on both BLM- and NPS-managed lands would be less than under Alternative A.	On BLM-managed lands, there would be a slight increase in livestock grazing compared with Alternative A, so there could be slightly more opportunities for impacts on visual resources from new structural and nonstructural range improvements{ XE "Range Improvement" }. There would be an increase in acres available for livestock grazing in VRM Class I, II, and III areas. While only fences,	Impacts under Alternative E would be slightly reduced from Alternative A because there would be fewer acres available for livestock grazing. this is true for both BLM- and NPS-managed lands.

(b)(5) DPP

[redacted]

Table ES-3
Comparative Summary of Environmental Consequences

Alternative A (No Action)	Alternative B	Alternative C	Alternative D	Alternative E
providing for natural ecological changes (VRM Class I). The nonstructural range improvements that could be designed to meet the objectives of all VRM classes include manual treatments, prescribed fire, and manual revegetation. The structural range improvements that could be designed to meet the objectives of all VRM classes include fences, gates, and corrals. Aside from Alternative D, Alternative A has the most acres available for livestock grazing where structural and nonstructural range improvements would typically meet or could potentially meet VRM Class objectives. For NPS-managed lands, there would be no nonstructural range improvements{ XE "Range Improvement" } to improve forage for livestock. Structural range improvements such as fences and gates, cattle guards, water catchments, and water pipelines could meet the objectives of the Recreation and Resource Utilization{ XE	features that potentially contrast with the natural landscape character and return those areas to a natural appearance. Removing unnecessary structural range improvements and implementing reclamation would meet the objectives of all VRM classes and could improve the inventoried scenic quality values. Removing range improvements would also be permissible in all of the NPS management zones and could improve the scenic values.		gates, and corrals could potentially meet VRM Class I objectives, there would be an increase in acres where other types of structural and nonstructural range improvements could meet VRM Class II and III objectives, so it is possible that there would be an increase in these types of activities. On NPS-managed lands, impacts on scenic resources would be the same as under Alternative A.	

[redacted]

Table ES-3
Comparative Summary of Environmental Consequences

Alternative A (No Action)	Alternative B	Alternative C	Alternative D	Alternative E
"Utilization" } Zone. All types of structural range improvements would be allowed in the Development Zone. Alternatives A and D have the same number of acres available for livestock grazing in the Recreation and Resource Utilization Zone and the Development Zone, where the most types of structural range improvements could occur.				
Wildland Fire Management				
Lands with Wilderness Characteristics				
Management of lands with wilderness characteristics would continue via the existing Management Zones and 2,000 acres would be unavailable for livestock grazing.	Management of lands with wilderness characteristics would continue via the existing Management Zones. Zero acres of lands with wilderness characteristics would be available for livestock grazing, and existing range improvements{ XE "Range Improvement" } may be removed; thus, the protection of wilderness characteristics would increase, in comparison with Alternative A and Alternative B would have the least potential for impacts among the action alternatives.	Management of lands with wilderness characteristics would continue via the existing Management Zones. Under this alternative, 69,800 acres of lands with wilderness characteristics would be unavailable for livestock grazing and passive management emphasized. Protection of wilderness characteristics would increase in comparison with Alternative A.	Management of lands with wilderness characteristics would continue via the existing Management Zones. Under this alternative, 1,300 acres of lands with wilderness characteristics would be unavailable for livestock grazing and the emphasis on active management through implementation of structural and nonstructural range improvements{ XE "Range Improvement" } would increase. Protection of wilderness characteristics would decrease in comparison with Alternative	Management of lands with wilderness characteristics would continue via the existing Management Zones. Under this alternative, 2,000 acres of lands with wilderness characteristics would be unavailable for livestock grazing; however, some previously unalloted areas would be available for livestock grazing. Because the previously unallotted areas would become available, the protection of wilderness characteristics would decrease, in comparison with Alternative A.

FOIA001:01673143

(b)(5) DPP [redacted]

Table ES-3
Comparative Summary of Environmental Consequences

Alternative A (No Action)	Alternative B	Alternative C	Alternative D	Alternative E
			A (b)(5) DPP [redacted]	
Wild and Scenic Rivers				
Management of 180 miles of suitable WSR corridors as available for livestock grazing and 80 miles of suitable WSR corridors as unavailable for livestock grazing would continue. No action would impair the free-flowing nature of a river segment.	No action would impair the free-flowing nature of a river segment. All suitable WSR corridors would be unavailable for livestock grazing, which diminishes the magnitude of impacts on ORVs and water quality. Protection of suitable WSR corridors would increase in comparison with Alternative A.	No action would impair the free-flowing nature of a river segment. Miles of suitable WSR segments unavailable for livestock grazing would increase to by 105 miles, which would diminish the magnitude of impacts on ORVs and water quality. Protection of suitable WSR corridors would increase in comparison with Alternative A.	No action would impair the free-flowing nature of a river segment. Miles of suitable WSR segments available for livestock grazing would increase by 50 miles, which would increase the magnitude of impacts on ORVs and water quality. Protection of suitable WSR corridors would decrease in comparison with Alternative A.	No action would impair the free-flowing nature of a river segment. Miles of suitable WSR segments unavailable for livestock grazing would increase by 20 miles, which would diminish the magnitude of impacts on ORVs and water quality. Protection of suitable WSR corridors would be similar, but slightly increased, in comparison with Alternative A.
(b)(5) DPP [redacted]				
BLM ~~Wilderness and~~ Wilderness Study Areas ~~and NPS Proposed Wilderness~~				
Under Alternative A, ~~85~~ 94 percent of ~~wilderness areas,~~ WSAs~~, and NPS proposed wilderness~~ would continue to be available for livestock grazing. The potential of livestock grazing and management to diminish wilderness characteristics	All ~~wilderness areas,~~ WSAs~~, and NPS proposed wilderness~~ would be unavailable for livestock grazing. This would eliminate the potential for livestock grazing and management to diminish wilderness characteristics.	Under Alternative C, ~~233,300~~223,100 fewer acres of ~~wilderness,~~ WSAs~~, and NPS proposed wilderness~~ would be available for livestock grazing than under Alternative A. The reduction in available acres would reduce the potential for	Under Alternative D, ~~28,600~~43,000 more acres of WSAs would be available for livestock grazing than under Alternative A. Overall, impacts ~~to wilderness areas,~~ on WSAs~~, and NPS proposed wilderness~~ would be similar to Alternative A, but the	Under Alternative E, ~~16,600~~2,200 more acres of WSAs ~~and 6,500 more acres of NPS proposed wilderness~~ would be unavailable for livestock grazing than under Alternative A. Overall, impacts ~~to wilderness areas,~~ on WSAs~~, and NPS proposed wilderness~~

DOI-2019-10 02305

(b)(5) DPP [redacted]

Table ES-3
Comparative Summary of Environmental Consequences

Alternative A (No Action)	Alternative B	Alternative C	Alternative D	Alternative E
would continue in ~~areas of wilderness,~~ WSAs~~, and NPS-proposed wilderness~~ that are available to livestock grazing.		livestock grazing and management to diminish wilderness characteristics in comparison with Alternative A.	potential for livestock grazing and management to diminish wilderness characteristics in the additionally available WSA areas would increase.	would be similar to Alternative A, but the potential for livestock grazing and management to diminish wilderness characteristics in the additionally unavailable WSAs ~~areas and NPS-proposed wilderness~~ would decrease.
NPS Proposed Wilderness				
Under Alternative A, ~~85~~ 58 percent of ~~wilderness areas, WSAs, and~~ NPS-proposed wilderness would continue to be available for livestock grazing. The potential of livestock grazing and management to diminish wilderness character~~istics~~ would continue in areas ~~of wilderness, WSA, and NPS-proposed wilderness~~ that are available ~~to~~ for livestock grazing.	All ~~wilderness areas, WSAs, and~~ NPS-proposed wilderness would be unavailable for livestock grazing. This would eliminate the potential for livestock grazing and management to diminish wilderness character~~istics~~.	Under Alternative C, ~~233,300~~24,900 fewer acres of ~~wilderness, WSAs, and~~ NPS-proposed wilderness would be available for livestock grazing than under Alternative A. The reduction in available acres would reduce the potential for livestock grazing and management to diminish wilderness character~~istics~~ in comparison with Alternative A.	Under Alternative D, ~~28,600~~1,600 ~~more~~ fewer acres of WSAs would be available for livestock grazing than under Alternative A. Overall, impacts ~~to wilderness areas, WSAs, and~~ on NPS-proposed wilderness would be similar to Alternative A, but the potential for livestock grazing and management to diminish wilderness character~~istics in the additionally available WSA areas would increase~~would be slightly reduced.	Under Alternative E, ~~16,600 more acres of WSAs and~~ 6,500 more acres of NPS-proposed wilderness would be unavailable for livestock grazing than under Alternative A. Overall, impacts ~~to wilderness areas, WSAs, and~~on NPS-proposed wilderness would be similar to Alternative A, but the potential for livestock grazing and management to diminish wilderness character~~istics~~ in the additionally unavailable ~~WSA areas and NPS~~ proposed wilderness would decrease.
Tribal Interests				
Alternative A would continue to result in both direct and indirect impacts or adverse effects. However, they may be minimized with the adoption of the Cultural Resources Management Protocol (**Appendix C**).	Alternative B would reduce grazing-related impacts or adverse effects on tribal resources and historic properties throughout the decision area, when compared with those alternatives that allow grazing	Alternative C, compared with Alternative A, would reduce grazing-related impacts or adverse effects on tribal resources and historic properties throughout the decision area. However, under Alternative C, potential	Alternative D would likely have grazing-related impacts on these properties throughout the decision area; this is similar to Alternative A. However, some sites now protected from grazing impacts would be open to	Alternative E could result in a slight decrease of grazing-related impacts or adverse effects on these properties throughout the decision area, when compared with Alternative A, because of the decreased AUMs and acres

(b)(5) DPP

[redacted]

Table ES-3
Comparative Summary of Environmental Consequences

Alternative A (No Action)	Alternative B	Alternative C	Alternative D	Alternative E
	to continue. However, removing range improvements{ XE "Range Improvement" } could involve ground-disturbing activities that may impact historic properties, either directly or indirectly.	structural and nonstructural range improvements{ XE "Range Improvement" } involving ground-disturbing activities, fire, or herbicides may impact tribal resources and historic properties, either directly or indirectly. Potential direct and indirect impacts or adverse effects under Alternative C may be minimized with the adoption of the Cultural Resources Management Protocol (**Appendix C**).	grazing under Alternative D. Therefore, they could be open to new grazing-related impacts not experienced under Alternative A. Potential direct and indirect impacts or adverse effects under Alternative D could be minimized with the adoption of the Cultural Resources Management Protocol (**Appendix C**).	available. Potential direct and indirect impacts under Alternative E could be minimized with the adoption of the Cultural Resources Management Protocol (**Appendix C**).
Socioeconomics				
Note: Dollar amounts provided below represent the quantifiable economic impacts based on the maximum number of permitted AUMs. These numbers are estimates based on best available data and should be utilized only for comparison of impacts by alternatives. Refer to Section 4.18 for detailed assumptions and methodology utilized in economic modeling.				
AUMs would continue to be available at their currently permitted levels. No grazing permits would be cancelled. Based on average actual use, annual net revenue for permittees is estimated to be $2,214,704.	Eliminating grazing would result in annual net revenue changes for individual permittees ranging from a loss of $358,761 to an increase of $10,606, under the modeled scenarios. All 136 grazing permits would be cancelled (a100 percent decrease).	Reducing AUMs would result in annual net revenue changes for individual permittees ranging from a loss of $207,641 to an increase of $2,047, under the modeled scenarios. The number of grazing permits would decrease by 38 percent, as 52 permits would be cancelled.	Increasing AUMs would result in annual net revenue changes for individual permittees ranging from a loss of $227 to an increase of $165,517, under the modeled scenarios. No grazing permits would be cancelled. Permits could be authorized for previously unallotted or unavailable areas that are now available for livestock grazing.	Reducing AUMs would result in annual net revenue changes for individual permittees ranging from a loss of $26,231 to an increase of $106, under the modeled scenarios. One grazing permit would be cancelled, but permits could be authorized for the previously unavailable allotment that is now available for livestock grazing.
Environmental Justice				
Under Alternative A, a continuation of the current management direction for	There would be no disproportionately adverse impacts on low-income or	There would be no disproportionately adverse impacts on low-income or	There would be no disproportionately adverse impacts on low-income or	There would be no disproportionately adverse impacts on low-income or

[redacted]
(b)(5) DPP

Table ES-3
Comparative Summary of Environmental Consequences

Alternative A (No Action)	Alternative B	Alternative C	Alternative D	Alternative E
livestock grazing is unlikely to have disproportionately adverse impacts on low-income or minority populations.	minority populations under the no grazing Alternative B. However, as noted in Nature and Type of Impacts, disproportionately adverse impacts, such as the loss of ranching operation revenues, may occur for ranchers with small-scale operations, which may include those of low-income or minority status. Differential impacts, such as enhanced native vegetation, could result on tribal populations who use the land for traditional cultural purposes under a no grazing alternative.	minority populations under Alternative C. However, as noted in Nature and Type of Impacts, disproportionately adverse impacts, such as the loss of ranching operation revenues, may occur for ranchers with small-scale operations, which may include those of low-income or minority status.	minority populations under Alternative D.	minority populations under Alternative E.

ES.8 References

BLM (US Department of the Interior, Bureau of Land Management). 1981a. Escalante Management Framework Plan. BLM, Escalante Resource Area, Cedar City District. April 22, 1981.

______. 1981b. Paria Management Framework Plan. BLM, Kanab Resource Area, Cedar City District. April 22, 1981.

______. 1981c. Vermilion Management Framework Plan. BLM, Kanab Resource Area, Cedar City District. April 22, 1981.

______. 1981d. Zion Management Framework Plan. BLM, Kanab Resource Area, Cedar City District. April 22, 1981.

______. 1997. Utah BLM Standards for Rangeland Health{ XE "Rangeland Health" } and Guidelines for Livestock Grazing Management. Internet website: http://www.blm.gov/ut/st/en/fo/vernal/grazing_/rangeland_ health_standards.html.

______. 1999. Escalante Management Framework Plan Approved Amendment and Record of Decision. BLM Utah State Office, Salt Lake City. March 15, 1999.

______. 2000. Grand Staircase-Escalante National Monument Management Plan{ XE "Monument Management Plan, Grand Staircase-Escalante National Monument (MMP 2000)" } and Record of Decision. BLM, Grand Staircase-Escalante National Monument, Cedar City, Utah. February 2000.

______. 2005. Handbook H-160-1, Land Use Planning Handbook. BLM, Washington, DC. March 11, 2005.

______. 2008a. Handbook H-1790-1: NEPA{ XE "National Environmental Policy Act (NEPA)" } Handbook. Rel. 1-1710, January 30, 2008. BLM, Washington, DC.

______. 2014. Grand Staircase-Escalante National Monument Scoping{ XE "Scoping" } Report for the Livestock Grazing Plan Amendment EIS. BLM, Grand Staircase-Escalante National Monument, Kanab, Utah. May 2014.

______. 2016. Grand Staircase-Escalante National Monument Preliminary Alternatives Comment Report or the Livestock Grazing Plan Amendment EIS. BLM, Grand Staircase-Escalante National Monument, Kanab, Utah. June 2016.

BLM GIS. 2014. Base GIS data on file with BLM's eGIS Server, used for calculations or figures to support the MMP-A. BLM, Grand Staircase Escalante National Monument, Utah.

NPS (US Department of the Interior, National Park Service). 1979. Proposed General Management Plan{ XE "General Management Plan, Glen Canyon (GMP 1979)" }. July 1979, reprinted August 1991. Glen Canyon Recreation Area/Arizona-Utah.

______. 1999. Glen Canyon National Recreation Area Grazing Management Plan{ XE "Grazing Management Plan, Glen Canyon (GzMP 1999)" } and Finding of No Significant Impact. NPS, Glen Canyon National Recreation Area, Page, Arizona. August 1999.

Proclamation No. 6290. Establishment of Grand Staircase-Escalante National Monument. September 18, 1996.

Dear Reader letter goes here.

Abstract goes here.